BOROUGH OF WARRINGTON.

REPORT

ON THE

EPIDEMIC OF SMALL-POX,

IN YEARS 1892-3,

IN THE BOROUGH OF WARRINGTON.

PRESENTED TO THE HEALTH COMMITTEE BY

J. GUEST GORNALL, M.A., M.B. (CANTAB),

Assistant Medical Officer of Health, and Medical Superintendent of the Hope Hospital.

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SMALL-POX EPIDEMIC.

Introduction.

In presenting a report upon the epidemic of Small-pox, of which we have now happily seen the worst, I desire at the outset to say, that I shall endeavour to conceal nothing that might reflect on the efficiency of your Health Department, nor to hide any of the defects of administration and management, which may have impaired its success in dealing with so serious a difficulty. The unenviable notoriety which Warrington has acquired in the country during the past year has, though in some respects deserved, been to a great extent the misfortune of its position. Situated as the town is on the high road between some of the great centres of population, and being a halting-place for tramps, who have played of late such an important part in the diffusion of Small-pox, it is little to be wondered at that it should early have been infected with a disease which, from some cause or other, was already on the increase in various parts of the country; but it is equally true that the alarmist reports in the local papers have not only helped to create a state of panic altogether uncalled for, but often, instead of helping on, seriously interfered with the carrying out of the measures projected by you for the good of the community. Criticism is an excellent thing for keeping public men up to the mark; so also to be wise after the event is an easy thing for those who have not borne the burden of difficulties unforeseen, and often insurmountable.

The peculiar liability of Warrington to become early infected with a disease so easily carried about as Small-pox is associated with other features which invest the town with considerable interest from a hygienic point of view. With a large industrial population earning good wages, and so not presenting those signs of starvation and destitution which must be of such importance in determining their liability to suffer severely from epidemic diseases, it has had the reputation of being in an advanced condition as regards Sanitary improvements, though it may have fallen behind in recent years. It was one of the earliest towns to adopt the notification of

infectious diseases, and has in recent times had the opportunity of seeing the advantages of the system applied to Small-pox. The isolation of these diseases by removal to hospital has also been carried out to a very large extent, and has, on the whole, even during the recent epidemic, tended not only to the good of individual cases, but must have helped, by saving parts of the town not immediately exposed to infection from the Hospital, to prevent the spread of the disease. For an instance of the value of a properly isolated hospital and a thoroughly equipped Health Department in checking the spread of disease, we have only to look to neighbouring towns.

The carrying out of the Vaccination Laws has, it appears, in Warrington been fairly good, and the neglect of the practice has been more a matter of culpable carelessness than a result of organized opposition ; the anti-vaccinators as a body do not exist here ; they will certainly be bold if they can raise their heads after the experience gained during recent months.

The general sanitary condition of the town is also a matter which gives cause for speculation at such a time as the present, and the feature which is one of Warrington's peculiarities—the pail system—should not escape observation in this connection. We have also to note that there was going on coincidently with the Small-pox a very considerable outbreak of Scarlatina, which was unlooked for, the experience of a good many years back having led us to expect such a thing only at certain regular intervals. The year 1892 was not the time for one of these periodic exacerbations of Scarlatina, which added greatly to the difficulties of the situation.

In dealing, therefore, with an epidemic which has not only been fatal to the lives of many of the inhabitants, but most disastrous to the trade of the town, I hope without fear or favour to give a faithful and accurate account of its rise, progress, and decline, in the hope that fresh light may be thrown upon the various prophylactic and defensive means at our disposal, and ways suggested for their better application in future emergencies.

History of Small-pox in Warrington.

There is no disease of which accurate historical details have so great an importance as Small-pox : the controversy on the value of vaccination has raged repeatedly round disputed statistics of outbreaks in former times, and it is consequently a matter for congratulation when one can add to the many already brought to light with regard to other places, some interesting particulars about the experience of Warrington in pre-vaccination and pre-hygienic days, as well as to trace to some extent the influence of modern progress upon the disease. I have been fortunate enough to obtain, from a source of information too much neglected, and probably not often thought of in connection with such matters—our Public Free Library

—some papers relating to Small-pox in former years. Among them is one reprinted from the Philosophical Transactions for 1774. It is entitled "The Bill of Mortality of the Town of Warrington for the year 1773," and was written by our celebrated townsman, the Rev. J. Aikin, and communicated to the Royal Society by Dr. Percival. It deals with a time when vaccination was as yet unknown, but when inoculation with variola, practised to some extent as a means of protecting the individual from a more serious form of the disease, which it undoubtedly did, acted at the same time as a general propagator of it. Its chief interest lies in the picture it gives of the awful ravages of Small-pox at that period, when there was neither the protection of vaccination nor any means whatever taken for isolation, and as representing the views of an intelligent and enlightened observer, I propose to quote it in full, as well as give the Bill, upon which his remarks are founded.

"The Bill of Mortality for the Town of Warrington for the Year 1773."

"The town of Warrington, by the best account yet procured, contains between 1,600 and 1,700 houses. At five persons to a house, which is supposed a sufficient allowance, as but few are occupied by more than one family, this will give somewhat above 8,000 for the number of inhabitants.

"The average of yearly Marriages, Christenings and Burials registered at the Parish Church from 1750 to 1769 inclusive is: Marriages, 73; Christenings, 237; Burials, 199. That for the years 1770, 1771, 1772, is: Marriages, 95; Christenings, 331; Burials, 258.

"This will serve to show the increase of the place, and its comparative healthiness; especially if we consider that the deaths are much more exactly registered than the births. In the present Bill the number of children who died after receiving only private baptism, in consequence of which their deaths were registered and not their births, amounts to 17; which might, therefore, be added to the average of christenings for the three last years, and will form an extraordinary instance of healthiness and increase.

"The present Bill also takes in the separate registers kept by different societies, of which the births much exceed the burials, as many of the latter are entered at the Parish Church.

"The melancholy overbalance of burials which now appears, principally arises from the dreadful ravages of a single disease—the Small-pox, which, perhaps, has seldom raged with greater malignity than in its late visitation of this town. Its victims were chiefly young children, whom it attacked with such instant fury, that the best means for relief were of little avail.

"The state of the air went through all possible variations in the course of it, but with no perceptible difference in the state

of the disease. In general the sick were kept sufficiently cool, and were properly supplied with diluting and acidulous drinks; yet where they recovered it seemed rather owing to a less degree of malignity in the disease, or greater strength to struggle with it, than any peculiar management. Where it ended fatally, it was usually before the pustules came to maturation, and in many they showed no disposition to advance after the complete eruption, but remained flat and pale. The gradual progress and decline of the disease will appear from the table of months. Its proportional virulence began to abate considerably before it ceased. I cannot with certainty lay down the general proportion of deaths, but in our neighbourhood I found that out of 29 who had the disease 12 died, or about two in five; in others mortality was still greater, and I have reason to believe it was not less on the whole. It may perhaps be worthy of observation that the proportion of females who died to males was nearly as three to two. While we lament the severity of the scourge with which we have been afflicted, we cannot but highly regret that a practice which experience has established as so effectual a security against it was so little followed. Not ten, I believe, were inoculated in the whole town and neighbourhood; these all did well, yet their example was not sufficient to overcome some accidental prejudices against it. Indeed, the poor, who were the chief sufferers in this calamity, besides their prejudices, might be deterred by the idea of expense attending this branch of medical assistance. But if the opulent and charitable would reflect how exceedingly useful their benefactions directed to this point would be, that by a proper encouragement of this practice the lives of 200 of the rising generation might in all human probability have been saved to the public in the course of the year, the regret of having lost such an opportunity of doing good would, I hope, be succeeded by suitable resolutions for some future occasion. It would be easy to suggest a plan for promoting the practice of inoculation at a very moderate expense, and I am persuaded the task of engaging the assistance of the faculty would be the least difficult part.

"With respect to the general table of disease the obvious uncertainty and inaccuracy of an enquiry, which in most cases could only be made by the Clerk in the Churchyard, made me despair of rendering it in any degree subservient to the purposes of science. It has not been attempted, therefore, to give it a scientific form, but the articles have for the most part been inserted just as they were given in. Indeed, the alarming article of consumption, which includes all those returned under the common terms of weakness, surfeit and decay, has been arranged under their different periods of age, to make the medical reader the better able to judge of the different diseases contained under it.

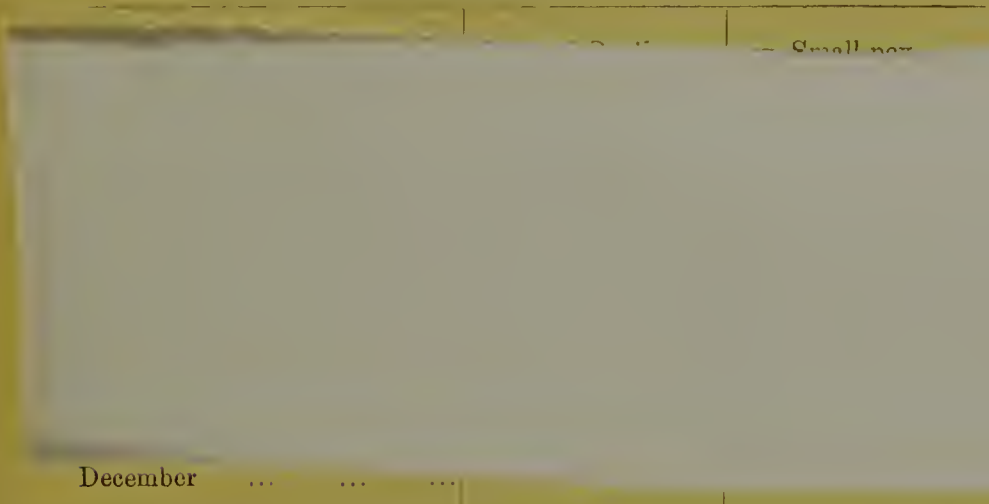
"The table of ages and conditions has been drawn up with great exactness, and will certainly in a proper series form useful grounds for the calculations in political arithmetic. In this light

it is hoped that the utility of accurate bills of mortality will be generally apparent; and that since the benefit of them is not confined to one profession all will concur in encouraging them."

Table 1.

Marriages, 93. Births: Males, 175; Females, 181; total, 356.
Deaths: Males, 223; Females, 250; total, 473.

Table 2.



December ... ...

Table 3.—Diseases.

Aged			32
Asthma			3
Casualties			5
Childbed			5
Chincough			16
Consumption under 14			24
,, 14 to 45		96	36
,, above 15			36
Convulsions			34
Dropsy			13
Fever			15
Inflammation of Bowels			2
Measles			1
Mortification			1
Palsy			7
Quinsey			1
Small-pox			211*
Soon after Birth			6
Suddenly			6
Teething			7
Worm Fever			10
Unknown			1

* *All under 10 years of age.*—My authority for this statement is an Essay on Small-pox, published in a volume of dissertations on similar subjects in 1789 by Dr. Percival, and to be found in the Free Library.

Though anticipating somewhat a later part of my report, I cannot refrain from inserting tabular statements of the mortality of years 1773 and 1892, a comparison of which is exceedingly instructive, especially in view of the tremendous severity of Small-pox among the children at the former period.

TABLE I.

Showing for Comparison the Mortality from all causes and from Small-pox, in Warrington, for the years 1773 and 1892.

The lessons to be drawn from a comparison of the figures of these two years are obvious. In 1773 Small-pox was so universal that practically all persons of 10 years and upwards, at that particular time, had been protected from it by a previous attack, so that, if such a rare thing as a second experience of the disease occurred, it was comparatively mild, while, in 1892, under 10 years persons only who had not been protected by vaccination succumbed to a disease now so rare, and, above that age, a certain number, who, for some reason or other, had been so unfortunate as to escape vaccination, and others in whom the immunity originally conferred had worn out, fell victims.

BILL OF MORTALITY FOR 1791.

Births	... ...	444
Deaths	... ...	286

Diseases.

Aged	... ...	32	
Asthma	... ...	9	
Childbed	... ...	2	
Consumption under 14	... ...	31	89
,, 14 to 45	... ...	38	
, 45 and upwards	... ...	20	

Convulsions	18
Dropsy	11
Fever	14
Rheumatism	1
Gravel	2
Inflammation of Bowels	2
Small-pox	10
Soon after Birth	7
Suddenly	7
Teething	7
Fever and Sore Throat	6
Mortification	2
Gripes	1
Surfeit	7
Measles	2
Jaundice	2
Influenza	2
Palsy	4
Cancer	1
Purples	1

In Table II. will be found ample evidence of the decline in the prevalence of Small-pox since the Rev. J. Aikin made these observations; but though I was not lucky enough to obtain a complete record of the yearly mortality since the above date, especially with regard of the closing years of the last century, the remarks made by Dr. Daniel Moss on the yearly bills for 1790 to 1792, which I give, will suffice to show that its ravages were still widespread and disastrous. The advocacy of inoculation which they contain shows how in face of so great and terrible danger any safeguard was welcomed: the belief that the spread of Small-pox depends upon the number of susceptible individuals rather than meteorological conditions, which it enunciates, is not inconsistent with the result of modern observation.

Remarks on Bills of Mortality by Dr. Daniel Moss.

1790.

"During the whole year of 1790, when two principal epidemics prevailed, namely, the Small-pox and Putrid Fever (which swept away a considerable number of inhabitants), the total of burials was less than the births by eleven, notwithstanding the births had that year decreased fourteen."

1792.

"The circumstance which hath occurred to raise the list of deaths of the present bill so much higher than that of the preceding must be solely ascribed to the natural* Small-pox, as the

*Natural, *i.e.*, as distinguished from inoculated.

mortality from other causes is diminished. This epidemic (the scourge of the human race) prevailed for the most part during the year, though not to the extent or with the malignity we have before experienced. As it made a complete progress through the town in 1790, there were comparatively few subjects capable of receiving the infection. From this, as well as the facts in our former bills, it appears that the spread of the Small-pox at a place depends solely upon the number of people liable to take it, and not upon any peculiar state of the air.

"Could we by any means (and the means are easy) introduce universal inoculation amongst the inhabitants of this country in the early parts of life, and if all beyond that stage had undergone the disease, by the same precautions in this predicament the infection however virulent could not extend itself in the natural way, but to a diminutive number of the community; the annual saving would be very considerable. There is no disease where we have it so much in our power and command to lessen mortality as in Small-pox by inoculation. It is a bridge furnished by Providence to pass over a yawning gulph, a raging whirlpool in which myriads of human species have been overwhelmed. Indeed, it is more than probable, that by this process (universal inoculation) executed at stated periods, we could, and in no great length of time, entirely exterminate from this island this foreign enemy."

The extract which I here give from a paper by the same authority on the vital statistics of the years 1788-1792, gives but the same picture of the awful results of Small-pox:—

"In the parish of Warrington, during the last five years, the births have amounted to 1,577, or 315 annually, the births giving a surplus of 115 at a medium, and if we reckon 10,000 inhabitants to the town of Warrington, the average of yearly deaths to the whole number is as 1 to 31. In Manchester it is 1 in 28. In Liverpool 1 in 27. In London 1 in 20¼. And in Edinburgh, although not more than 50,000 inhabitants, yet the deaths through the different stages of life agree nearly with London. The cause is obvious—infant deaths everywhere swell the gloomy lists of mortality, especially in cities and larger towns, which are in a peculiar degree fatal to them. In London and all the great capitals of Europe, upon an average, one half of the children born die under two years of age. In country towns and villages the proportion of infant mortality greatly decreases. In Manchester half the children born die under four years of age. In Warrington about 4 in 11 die under that age; but were the ravages of Small-pox prevented by any means, the number of deaths under that period would not fully amount to one in four, and hence may be demonstrated the benefit arising from a general inoculation."

I would draw attention in connection with the above extracts to the importance attached by the writer to the influence of Small-pox on the appalling infant mortality there was at that time. If we consider the infinitesimal contribution by death from Small-pox of

vaccinated children to the mortality under ten years of age, we shall not hesitate to believe that a means of combating this dreadful scourge is at our disposal.

I have collected also from bills of mortality of the end of the last and early part of the present century, as well as from the death-registers of later years, the total deaths from all causes, and from Small-pox; unluckily no particulars of the age-fatality were available. Though, unfortunately, the figures of many of the earlier years were not obtainable, the deficiency is not so great as to make us hesitate to believe that Small-pox was endemic, that is, was always, though varying in severity from time to time, a factor in the annual mortality of the town. In former days the result of an epidemic depended entirely on the number of individuals who, by having had the disease already, had obtained an almost perfect protection from a second attack; now-a-days, not only the fatality but the prevalence of Small-pox is directly proportional to the efficiency of the vaccination of the population. A reference to the figures shows this clearly, for each extension of the practice has resulted in a diminution of the mortality from the disease, and this began long before the introduction of such modern institutions as an isolation hospital and compulsory notification of disease, indeed before improved sanitation had begun to exert an appreciable effect in reducing the deaths from preventible causes in the town, which even twenty years ago was notoriously unhealthy.

Table II.

Deaths from all causes, and from Small-pox, in Warrington, from 1773.

	Year.	Total of Deaths from all causes.	Number of Deaths from Small-pox.	Percentage of total Deaths due to Small-pox.
Population, 8,000	1773	473	211	44·6
	1791	286	10	3·4
	1792	314	52	16·5
	1794	319	68	21·3
	1795	314	46	14·6
	1796	441	92	20·8
	1797	248	20	8·0
Population, 10,567	1801	421	54	12·8
	1807	322	1	0·3
Population, 11,738	1810	396	74	18·6
	1818	476	5	1·0
	1820	320	7	2·1
Population, 13,570	1821	349	14	4·0
	1822	339	29	8·7
	1823	416	28	6·7

TABLE II (continued).

		Total of Deaths from all causes.	Number of Deaths from Small-pox.	Percentage of total Deaths due to Small-pox.	
	1825	347	17	4·9	
	1826	524	32	6·1	
	1827	439	24	5 4	
	1828	400	17	4·2	
	1829	486	21	4·3	
	1832	559	33	5·9	
	1833	531	28	5·2	
	1834	579	8	1·5	
	1835	391	2	0·5	
	1836	439	77	17·5	
	1837	577	14	2·4	
	1839	494	5	1·0	
	1840	481	18	3·7	
	1841	472	26	5·5	
	1842	517	6	1·1	
	1843	422	2	0 4	
	1844	424	2	0·4	
	1845	403	3	0·7	
	1846	615	40	6·5	
	1847	1011	27	2·6	Vaccination gratuitous, but optional, for seven years. Eighty-five deaths from Smallpox. An average of Twelve Yearly.
	1848	571	1	0·2	
	1849	617	2	0·3	
	1850	561	0	0	
Population, 22,894	1851	597	53	8·8	
	1852	571	2	0·3	
	1853	644	0	0	
	1854	644	0	—	Vaccination compulsory, but inefficiently enforced, for 18 years. 131 deaths from Smallpox. An average of Seven Yearly.
	1855	555	0	—	
	1856	562	0	—	
	1857	698	0	—	
	1858	610	1	0·1	
	1859	565	30	5·0	
	1860	581	1	0·17	
Population, 25,953	1861	736	0	—	
	1862	635	0	—	
	1863	1198	1	0·08	
	1864	801	17	2·1	
	1865	743	31	4·1	
	1866	1016	0	—	
	1867	769	0	—	
	1868	828	0	—	
	1869	875	15	1·7	
	1870	983	30	3·0	
Population, 32,144	1871	901	5	·5	

TABLE II (continued).

	Year.	Total of Deaths from all causes.	Total number of cases of Small-pox.	Deaths from Small-pox.	Percentage due to Small-pox of total Deaths.	
	1872	768	—	15	1·9	Vaccination compulsory for 20 years; 80 deaths from Small-pox. An average of Four Yearly.
	1873	803	—	0	—	
	1874	895	—	5	·5	
	1875	948	—	1	·1	
	1876	926	—	1	·1	
	Fever Hospital Established 1877.					
	Compulsory notification introduced 1879.					
	*1877	907	2	0	—	
	1878	905	8	0	—	
	1879	982	0	0	—	
	1880	823	0	0	—	
Population, 41,456	1881	841	2	1	·1	
	1882	1037	3	0	—	
	1883	947	1	0	—	
	1884	943	4	0	—	
	1885	838	0	0	—	
	1886	961	0	0	—	
	1887	1122	0	0	—	
	1888	995	7	2	·2	
	1889	1084	0	0	—	
	1890	1152	0	0	—	
Population, 52,742	1891	—	0	0	—	
	1892	1267	490	55	4·3	

THE EPIDEMIC OF 1892-93.

Warrington, which, with insufficient accommodation for isolation, had so luckily escaped for many years any considerable outbreak of Small-pox, was destined in 1892 to undergo an experience of it which ought, on the one hand, to add enormously to the already irresistible evidence in favour of vaccination, a practice without which even the most perfect and rapid means of notification and isolation must break down in times of epidemic; and on the other, to pave the way for the provision of hospitals apportioned to and supported by larger administrative areas than a small borough like this, on which the burden of their maintenance would fall too heavily. The latter project has already received the support of, and been brought before the Lancashire County Council by, Dr. Sergeant.

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* All the cases from 1877 have, without exception, been introduced, so that Small-pox cannot be said to have been endemic since then; as to the previous years no records are available

Of the general conditions which have led to an increased prevalence of Small-pox all over the country, it is not my intention to attempt the discussion ; suffice it to say they depend upon causes of which we have little definite knowledge. It may, however, be advisable to point out that we ought not only to think of our own unpreparedness to meet the outbreak in the most satisfactory manner, but of the possibility of an increased liability of the community at this particular time to take Small-pox. Increased or diminished susceptibility to the incidence and fatality of infectious diseases is mainly influenced by season, by hygienic and social conditions, such as density and occupation, &c., and by the sex and age distribution of the population. On the other hand, we must also remember that certain causes seem to determine an increase in virulence of the poison of the disease at certain periods, now happily rare in the case of Small-pox. But here we come round again to the question of personal susceptibility, so dependent on vaccination in this case. In the course of an epidemic two opposing factors seem to be at work. It would appear as if, in certain communicable diseases, the passage of the virus through susceptible individuals causes a progressive increase in its virulence and fatality, so that the comparative mortality tends to rise. At the same time, as it goes on, the epidemic gradually weeds out the more susceptible individuals (luckily, in case of Small-pox, it is possible for everyone to render himself insusceptible), and meets with more resistance ; the result is that, towards its close, we have a decrease in the severity and mortality of the attacks.

I have already given an account of the previous history of Small-pox in Warrington, as far as I could obtain it. The epidemic was, on this occasion, as not uncommonly occurs, preceded by a small outburst, which did not spread to any extent. This forerunner of the coming storm occurred in May, 1892, when cases were introduced into the Rural Sanitary District. A family who had recently come to live in Ackers Lane, Latchford, were the sufferers. They had left a farm in the neighbourhood of Halifax, where there was a man suffering from Small-pox, at that time prevalent in that district, on May 2, and three were subsequently attacked at Latchford.

The cases occurred in the following order :—The son, on the 6th May ; father, on the 8th ; and daughter, on the 9th ; the only other member of the family then there, the mother, escaping.

A medical man was called in on the 10th, and on the 15th application was made to the Town Clerk, in the absence of the Medical Officer of Health, for their admission into the Borough Fever Hospital. This was sanctioned, and they were admitted on the evening of that day. In his report on this occurrence, dated 18th May, 1892, the Medical Officer of Health called attention to the great danger incurred by the reception of Small-pox cases at Aikin Street. He said :—

" Up to the present time we have been able to cope with introduced cases notified from the Borough, but as I pointed out

" in *February*, 1889, there is very great danger in treating Small-
" pox cases in close proximity with a populous neighbourhood as
" Aikin Street is, and two full wards of Scarlet Fever in our own
" grounds.

" The experience gained by the Sheffield epidemic points to
" the fact that Hospital accommodation designed for the reception
" of Small-pox requires a much larger space about it than sites for
" other infectious diseases. It is nothing unusual for Small-pox
" Hospitals to disseminate the disease, and we run a considerable
" amount of risk in treating Small-pox in the small ward (originally
" intended for the treatment of typhoid) near the administrative
" department, past which tradesmen and others are constantly pass-
" ing, in addition to the nearness of adjoining streets and our own
" wards.

" I wish to point out that five days transpired between the
" recognition of the disease and any definite action being taken to
" isolate. As I have pointed out before, the Rural Authority
" have neglected* to adopt the notification Act, and thereby
" endanger not only their own safety but that of adjoining
" districts." (From the Medical Officer's weekly report, 18th May,
" 1892.)

The Aikin Street staff were re-vaccinated, and the precaution of barricading off the small ward in which the Small-pox patients were placed, was taken, and no spread took place except in case of a man, who was employed to remove the infected bedding from Ackers Lane to the disinfector. He had, unfortunately, not been re-vaccinated; he was admitted to Hospital on June the 4th, suffering from a mild attack. None of these four were of a severe type, and all were discharged by the last day of June. No further cases are known to have been connected with the above, and it was hoped and expected that there would be no more trouble, but the risk to the town that had been run was the subject of a further communication to the Health Committee from the Medical Officer on July 16th. He again urged the desirability of more suitable provision for Small-pox, and also called attention to the inadequate accommodation for Scarlatina existing at that time. It seems impossible in any way to connect the outbreak that occurred in May with the origin of the general epidemic to which we now come.

On July 28th, the owner of a Lodging-house situated in Friars' Green, suspecting something wrong, brought down to the Fever Hospital in Aikin Street, walking through some of the principal streets, a man suffering from Small-pox. He had the confluent variety of the disease, the rash of which was in the second day: he was admitted and isolated in a disused Ducker Hospital. The sufferer, who was a navvy, had, accompanied by his brother, tramped from Lincolnshire, staying in Sheffield on the way, and arriving in Warrington on or about 17th July. From

* Adopted by the R.S.A., 1st October, 1892.

that time till his admission to Hospital he lived at the above Lodging-house, and worked on the Ship Canal. The man himself had never been vaccinated, the brother had ; the latter escaped scot free, the former died on the 5th August. His movements, before he came into Hospital, unfortunately cannot now be traced, and it is difficult to say what connection, if any, they had with the next cases.

There was a considerable interval, however, before any more were brought to the notice of the Medical Officer of Health, the next being on the 18th of August. It appears probable, however, from investigations I have made, that the second case in point of origin was one notified on the 23rd of August. This was an unvaccinated child 11 years of age, living in the Whitecross Ward, who had an attack of confluent Small-pox, which eventually proved fatal, but was unfortunately not recognized by the medical attendant for some days after the characteristic eruption had developed. He was removed to the Aikin Street Fever Hospital on the day he was reported, and died on the 26th. I have been unable to trace in any way the source of infection in his case, but can with greater certainty assert that he gave rise to a considerable number of the subsequent cases in the immediate neighbourhood of Howard Street. The visits of friends and neighbours appear to have been unrestricted while the boy remained ill at home, and it is no wonder that the dates of infection in many of them, who took Small-pox, correspond exactly with these visits.

Before, however, this case was made known to the Health Department, several had already been reported, and the provision of hospital accommodation was, at the request of the Medical Officer of Health, apprehensive of a serious outbreak, already under the consideration of your Committee.

By the 24th August negotiations for the purchase of land behind Aikin Street Hospital had been completed, and a contract for the erection of an iron hospital to be finished within 14 days had been accepted. An unfortunate combination of circumstances prevented this ever being used for the purpose, for which it was intended. The severity of the weather caused great delay in its erection, and by the time it was ready a vastly larger building was required. The town had, meantime, been placarded with directions to the public as to the prevention of infection, and strong recommendations in favour of immediate vaccination and re-vaccination issued.

Of thirteen cases, that occurred during the fortnight ending August 27th, two were at the Fever Hospital, and the others in such widely separate localities as Friars' Green, Priestley Street, Guardian Street, Liverpool Road, Winwick Street, Haydock Street, and Percy Street. Of these the first made himself known to the Medical Officer of Health by walking through the town and surrendering

himself at Aikin Street. He was a navvy living at the lodging-house in Friars' Green, and who had been there while the first case of all was there. He seems to have got the disease, if not from that one, at anyrate from the house in question. He worked at the Longford Gas Works, and his daily walks were along Winwick Street and Winwick Road. Whether he managed to distribute infection along the route by his clothing or otherwise has been a matter of speculation, as the rash had been out two or three days when he was admitted.

As regards the cases of Small-pox in Aikin Street, both were mild ones—one in a scarlet fever patient, the other in a kitchen-maid who had unfortunately escaped re-vaccination (she had come there since May); as to the way in which they contracted the disease, I shall have to speak later. In case of those in Winwick Street neighbourhood, I have already afforded some suggestion of possible conveyance of infection, but as regards several others, especially in Liverpool Road, Percy Street, and Guardian Street, I have a very reasonable explanation to offer. A man employed in the burial of Wm. R. (the first case) on August 5, on that same evening is known to have spent some time in an inn in the vicinity of Aikin Street Hospital. A fortnight to the day from that time three men living in the above streets, who had also spent the evening there as well as two servants employed there, were taken ill with Small-pox. The three former were notified, the two latter, very slight cases, were never made known to the Medical Officer of Health, but were sent home by their master on the 19th of August. In the case of one of them, living in Golborne Street, there was a considerable harvest of infected persons, for a fortnight from the day of her return home, her sister developed severe Variola, and subsequently relatives living in Cockhedge, who had visited them, were attacked: two of them died.

Naturally, it was not possible at the time to afford such an explanation of these particular instances; the facts I have stated have only been made out by repeated and careful investigations, and I only quote them to show how we have been handicapped by ignorance, and indifference on the part of householders, not yet alive to the duty of notification legally devolving upon them, and among whom, even yet, an Allwise Providence is looked upon as the sender of every epidemic, from which escape of the foredoomed is impossible. It is such a spirit of fatalism, that has led neighbours to crowd in to show their sympathy for an unfortunate Small-pox patient by drinking tea around his bedside, and to throng round the ambulance to take a farewell look at him. I could give numerous instances of such foolhardiness. The most perfectly-equipped Sanitary Authority with the best appliances for dealing with epidemics requires undoubtedly as its correlative the co-operation of an enlightened and

intelligent public ; instead of this in Warrington, we have had to contend with indifference, even antagonism to our efforts to stamp out the enemy.

The subsequent progress of the epidemic will, I think, be most clearly seen from the spot maps on which I shall be able to show the distribution of cases, relatively both to Aikin Street Hospital and to the Hope Hospital, subsequently acquired in Dallam Lane, but I may as well detail as far as it is possible the history of events up to the institution of the Hospital which, whether its influence has been on the whole for good or evil, has seen the worst experiences of this troublous period. At no time was it possible to receive into the Aikin Street Hospital more than 13 Small-pox patients at once, the space already provided for scarlet fever being completely occupied; and on Sunday, September the 11th, when the number known to the Medical Officer of Health was already 48—4 of them in the Workhouse, 13 in Aikin Street, the rest at home, at an urgently-called meeting of the Sanitary Committee, the report of a further outbreak led to a resolution to provide additional accommodation without delay. After some difficulty, the Heybridge Ironworks in Dallam Lane was fixed upon as the most suitable building available for the purpose, and with great energy and perseverance the cumbrous machinery was removed from the long shed since used for the reception of acute cases, and two wards for male and female patients respectively, with an intervening nurses' room, made out of it.

These wards were completed for the reception of patients on September 18th, when I remember to have visited them in company with some members of your Committee. On the following day 21 cases were admitted there, 13 of them transferred from Aikin Street Hospital, which from this time took no more cases in.

It was of course imperative at the time to obtain without any delay some place, where the rapidly increasing number of cases could be removed from their homes, in which there was generally not only not the slightest possibility of isolation, but also in many cases the greatest destitution ; there was also to be considered the absence of medical attendance, for doctors were naturally not over anxious to endanger their other patients by looking after these cases. The iron building still in course of erection and not to be completed till October was no encouragement to your Committee to undertake the erection of a fresh building, even if the necessary land could have been got in any suitable locality. Under the circumstances, therefore, the selection of the Heybridge Ironworks was at the least excusable, and the Hospital on this site, if it has not been of beneficial influence to the immediate neighbourhood has probably been a great protection to the town at large.

On September 24th, when the total number of cases since the epidemic started had reached 89, and the Hospital was now strained to its utmost capacity, a resolution to provide additional accom-

modation was come to, and the work set in hand at once, but the difficulties of getting any alterations quickly completed were now greatly enhanced, for workmen could only with diffieulty be persuaded to come into the Hospital when Small-pox eases had been once admitted; and if onee induced to eome the mere suggestion of vaecination was enough to drive them away; indeed, more than one who refused vaccination and was "not afraid of infection" paid the death penalty for his foolhardiness.

The work now taken in hand was not finished till about the 6th October, when the number of patients was about 118, and then it was possible to remove about 50 of them into these new wards, heneeforward to be used for eonvaleseent eases only. On 28th September I was appointed Assistant Medieal Officer of Health, and Superintendent of the Hope Hospital, the duties of whieh posts I was, however, unable to begin till Oetober 4th.

The weekly number of cases now oeeurring was gradually increasing, and a reference to the figures* will afford some illustration of the extent to which our powers were taxed. The diffieulty of organizing into something like system the management of a place hurriedly filled with Small-pox patients (who are usually of a somewhat unruly class), in all stages of the disease, was tremendous; and absence of any aeeommodation for the staff, the middle room having had to be given up to patients, materially contributed to the unsatisfaetory state of affairs at this period.

I aeeordingly applied soon after my entry upon my duties for some proper aeeommodation for the staff, who went down every evening in a eab, specially kept for them, to Aikin Street, where they, as well as myself, had to find sleeping room. The objections to this were obvious, and not the least was the additional strain it put upon the already over-tired nurses; besides, though they invariably changed their outer garments, it added to the chanees of distributing infection. Aecordingly on the 11th October a resolution was passed in favour of the purchase of some buildings for residential purposes, at a cost of £125.

These eonsisted of a wooden building, the ereetion of whieh was completed on November 9, when the nurses began to oecupy it as a sleeping-room, and theneeforward ceased entirely to visit Aikin Street, and an iron building, containing further rooms for the staff, and in whieh I myself have lived sinee it was finished on Deeember 1st. The long delay in the completion of these plaees must be attributed, as before, to the unwillingness of workmen, as well as to the inelemency of the weather. I cannot omit to say how admirably and conscientiously the staff worked under the difficulties of the time, when they had no proper dwelling accommodation, the provision of which was no unneeessary extravagance. At a later period, in November, when we were most pushed for room, I myself undertook to have made another ward, to aeeommodate 22 patients, out of a disused shed on the premises; and, being

* Table III.

fortunate enough to possess among them skilled workmen willing and able to help us, we had the place ready in a very few days. This tided us over the difficulty.

As regards the means taken for cutting off any communication between the Hospital and the surrounding neighbourhood, I must say that at first this was exceedingly unsatisfactory. We were, to begin with, separated from a large waste space of ground —bounded on the south by Stamford Street, on the north by the railway embankment, and on the east by Winwick Road—by an old broken-down railing, and divided from the disused ropewalk which lies at the back of Owen Street by a brook which empties itself into the main drain in Dallam Lane.

These were quite insufficient to counteract the morbid curiosity of the surrounding inhabitants; indeed, on the first two Sundays of the Hospital's existence it is said that numerous visitors assembled in the yard from over the railing, and were greatly edified by the spectacle of "another dead un" being removed to the mortuary. There was indeed considerable ground for complaints of communication between patients and their friends both then and later. Within the first fortnight, however, a better hoarding was put up, incomplete, however, at first; some of our own men finished it off. On October 19th it was resolved to barricade Dallam Lane above and below the Hospital gates, and provide a policeman to keep the people from crowding in the neighbourhood; the latter soon came, but the former desirable addition was not completed for a fortnight: at the same time the provision of further and possibly permanent accommodation for Small-pox was thought advisable, and a deputation appointed to see the Pear Tree Farm at Winwick. These delays interfered sadly with all my plans for establishing a better *régime*, but I must say that, despite the serious disadvantages attaching to its position, the Hospital has, on the whole, fulfilled well the purpose it was intended for.

As I am in this part of my report, as far as possible, confining myself to a narrative of the progress of the epidemic without entering into any controversial points, what I have to say about the measures taken for promoting re-vaccination shall be as brief and concise as possible.

The desirability of re-vaccination, so strongly urged by the Medical Officer of Health in August, has unfortunately been a point that could be impressed on the general public only by panic, though many employers of labour were able to bring pressure to bear on their workpeople in this direction.

Very little re-vaccination took place at first, and it was then generally among the inhabitants of infected houses, and a result of persuasion on the part of medical attendants. On September 5th, the Medical Officer of Health, who is also public vaccinator for the Warrington Union, in his dual capacity wrote to the Board of Guardians requesting the provision of a

station for revaccination every evening in the Whitecross Ward, where Small-pox was at that time most prevalent. This was granted, and he attended at a house in Priestley Street for five weeks, from September 6th, by the end of which time the numbers, never large, of people who came were so small as not to justify its further continuance. It is said that not a single employé of the large iron works in the neighbourhood, Dallam and Whitecross, was re-vaccinated here.

The epidemic was now, however, at its height in another ward of the town, and though there was an increase in the number, mostly women and children, coming to the permanent weekly station in Golborne Street on Tuesday afternoons, this afforded no facility for workingmen and others who could not come to be re-vaccinated at that time of the day. The Medical Officer of Health accordingly, on November 2nd, recommended to the Guardians the opening of this Golborne Street station on two days of the week instead of one, one attendance, for re-vaccination, to be in the evening. The Guardians replied on the same day "That it was decided by a majority of those present that it was unnecessary to arrange for any additional attendances."

This decision arrived at, let us hope, without a due consideration of its momentous nature, led to Dr. Thompson, Local Government Board Inspector, who was to have come shortly to pay his usual visit to examine the vaccination at the public station, anticipating that event, and coming to inquire into the circumstances of this case.

The week ending November 12th, during which his visit was paid, saw an alarming increase of the disease, for no less than 79 cases were notified. Of these about 30 had to be left in their own homes; but it was afterwards possible to take into hospital a good many of them, the extra ward which patients made, as I described above, helping us greatly in this predicament. Afterwards, the houses of those, about 13 in all, whom it proved impossible to admit, were placarded with a notice to the effect that there was Small-pox in them. The town was stricken with a panic which the newspapers, as well as erroneous statements circulated everywhere, helped to keep up, and though it is difficult to estimate the degree of severity the epidemic would have reached had not the measures been taken which proved so beneficial, it is safe to say that whereas now suspectible individuals are being attacked by twos and threes, hundreds would have been infected, and the mortality would have been enormous.

The result of Dr. Thompson's visit and conference with the Guardians, as well as the Health Committee, was to induce the former to reconsider their decision, and, though strongly emphasising his belief that main reliance as regards the arrest of the epidemic must be placed upon vaccination, he recommended to the Urban Authority the desirability of immediately providing further hospital accommodation in a sufficiently isolated locality

He also made certain suggestions about disinfection and the improvement of the general sanitary condition of the town. In consequence of this advice your Committee, on the 14th November, sent a deputation to Manchester to estimate the cost of a temporary hospital, and on the 15th your Chairman and Medical Officer of Health were appointed to go to London with the same object in view.

On the 16th of November, at a large representative meeting of the medical men in Warrington, the unanimous opinion was expressed that vaccination and re-vaccination were our best means of stamping out the small-pox, and a resolution passed, that it was advisable to open stations for gratuitous vaccination every evening.

This recommendation was adopted by your Committee, which thus took upon itself, in the interest of the public health, a duty legally devolving upon the Board of Guardians. The Medical Officer of Health was empowered to open five vaccination stations in different parts of the borough, and to arrange with medical men to attend there daily at 7 p.m.

These stations were opened on November 21st, and continued so for the rest of the week. At the same time, the extra attendances of the Public Vaccinator for a period of six weeks were begun, while the employers of labour were making provision for the re-vaccination of their workpeople, upon whom in many cases considerable pressure was brought to bear to induce them to undergo the operation.

The result of these extraordinary facilities for procuring re-vaccination, combined with the panic which the alarming increase in the epidemic had caused, was that at least a third of the population had been rendered immune to the disease by the beginning of December. I believe that I shall be able to show very conclusively that the decline of the epidemic has been almost entirely due to the large number of people re-vaccinated, especially so in the neighbourhood of the Hope Hospital. Nothing has happened to weaken, either before or after the panic, our belief in the protective power of vaccination.

The cases, that have since occurred, have not only been less in number, but shown a gradual diminution in severity, if we except a few that cropped up towards the latter end of February; and not the least thing to be rejoiced at is the fact that, in a week or two from the worst period, we were able to isolate all the cases with our existing accommodation. The policy we adopted, when the epidemic was at its height, was to remove those patients whose condition and surroundings seemed to make it most desirable; by the middle of December we were, however, able to do this for all.

It was about the middle of November that, in view of the state of Warrington, the Medical Officer of a neighbouring authority issued a proclamation which not only threw doubts on our determination to overcome the enemy, but was a serious menace to the trade of Warrington—the local newspapers of that time furnish an account of the action taken by your Committee in connection with this.

Several other matters of importance with regard to the public health have cropped up. One was the question, which arose as to the desirability of closing the Schools. The view taken by the Medical Officer of Health was that more was done to prevent the spread of infection by the means, which had been adopted for some time, namely: the exclusion of children known to come from infected houses. I may say that during the epidemic, whenever a case of Small-pox was made known to the Health Department, printed directions as to the prevention of infection, and recommendations to the other inmates to be immediately re-vaccinated, were at once left at the house by the Inspector, while at the same time notice of the house being infected was sent to the places of work and the schools to which the inhabitants went.

A resolution of your Committee to confer with Dr. Sergeant on the question of the provision of Hospital accommodation for Small-pox for larger areas than a borough like Warrington, led to his coming here, and, after discussion of the question, to his promising to lay the matter before the County Council, which he has since done.

The cases, that have occurred since the epidemic has been less severe, have been either among the non-revaccinated residuum of the stationary population or among new comers to the town. There have been two sources of infection, that have of late been of considerable importance; the one the result of the secretion of a case in a common lodging-house in January, which led to eight or nine other cases, one of which was wandering about the town for some days before being detected. The non-reporting of this lodging-house case led to a prosecution under the Infectious Diseases Notification Act, which resulted in the infliction of a fine —as also occurred in another case a few weeks later. It is a great pity that we were not able earlier on to show to householders the legal duty devolving upon them, and by a prosecution to set an example, but the cases where there was neglect all admitted of some excuse on the plea of ignorance. The other was the outbreak existing in a part of the Rural District contiguous to and virtually, though, unfortunately, not for administrative purposes, forming part of the Borough; I refer to Sankey Bridges.

[redacted] Rural District as the Medical Officer of Health thought [redacted]

We have now had 23 admitted, many of them of a severe type, a great contrast to what we have lately had in from the Borough.

Vaccination.

In discussing the question of Vaccination, its influence generally in protecting the people from the ravages of Small-pox

during the past year, and the special share which we believe it to have had in mitigating the severity of the epidemic, I am confronted with the difficulty there is in treating the subject in a manner easily comprehensible by the general public. A report to a Health Committee should not, I hold, deal largely in medical technicalities, but should, while endeavouring to be scientifically accurate, put matters of vital importance to the health of the community in as popular a light as possible, and in this particular instance I believe I shall be doing no less than my duty in laying before the people of Warrington the facts of the case. The value of Vaccination as a protective against Small-pox is, to my mind, the most absolutely certain fact in medicine, and when one knows the erroneous views entertained about it, the illogical arguments used against it, and the want of courage and independence of many of the medical men (I do not say in Warrington) in supporting what they know to be the truth, and in carrying out efficiently the Vaccination Laws, one has little hesitation, in such a case, in throwing off professional reserve, much as I value that.*

The trouble taken to promote Vaccination and Re-Vaccination during the recent epidemic has been very considerable; to strongly urge their importance was one of the earliest measures taken by the Medical Officer of Health, when we were first threatened. At a later date (November 9th), it is believed that a public notice, which was issued under your direction, had a very powerful effect in securing the carrying out of the means it advocated.†

The Vaccination Officer and Assistants appointed temporarily at Dr. Thompson's suggestion, carried out during November and December a house to house visitation, more particularly in those parts of the Borough where Small-pox was rife. I have already given an account of the various events which led up to the provision of Vaccination at the expense of the Borough, as well as mentioned the pressure brought to bear upon the workpeople of the town to this end. I shall, therefore, confine myself to an account of the results of these measures.

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† The placard, which I here give, was practically a copy of one which the Health Authorities of Sheffield issued during the outbreak of 1888-89, but contained a record of our experience up to the time, put in a popular form.

BOROUGH OF WARRINGTON.

SMALL-POX.

Small-pox is the most infectious of all diseases ; to those who are not properly protected by Vaccination, it is also the most deadly of all infectious diseases.

The only certain protection from Small-pox is Vaccination and Re-vaccination.

Out of 340 cases that have occurred in Warrington since the 28th July, 1892, not one single successfully Re-vaccinated case has been reported as having died, and of the 22 deaths that have occurred at the Hope Hospital up to the present date, 9 were unvaccinated, 1 vaccinated after infection, 9 very imperfectly vaccinated, 3 moderately vaccinated, and of these one was known to be a person of intemperate habits, and one died from complications subsequent to Small-pox, and *not one* had been re-vaccinated, and *not one* could be called a well-vaccinated person.

If everybody in Warrington had been re-vaccinated three months ago, there would not now be a single case of Small-pox in the town.

In many cases the protective power of Vaccination becomes gradually weakened, so that it has not its full effect ; and in some this protective power is, after a time, entirely lost. Therefore if you have not recently been successfully re-vaccinated, lose no time, but go to your doctor, or to the Public Vaccinator, and have yourself re-vaccinated. This, if done in time, will ensure your safety.

If you have any unvaccinated children, have them vaccinated at once.

In the meantime avoid exposing yourself to the infection of Small-pox. Do not enter a house infected by Small-pox ; have no communication with those living in such a house, and especially do not allow them to enter your house.

By Order of the Health Committee,

JOHN H. GORNALL,

Medical Officer of Health.

9th November, 1892.

The method of setting forth the value of Vaccination must, of course, be largely statistical, and so will probably be anything but interesting reading to the majority of people. I shall endeavour, however, to make mere numbers tell the truth as plainly as I can, and I propose to deal with the matter under three main heads, necessarily merging one in the other.

1. The general condition of Warrington as to Vaccination.
2. The general influence of Vaccination in the epidemic.
3. The influence of the special measures taken for promoting Re-Vaccination by various authorities in the town.

Table III.

Showing the Weekly Number of Cases notified, their Distribution, and other particulars.

Week ending	Distribution as regards Wards, &c.											Total number of Cases notified or discovered.	Removed to Hospital.		Treated at Home.	Deaths.	
	Town Hall.	Whitecross.	Bewsey.	St. John's.	Fairfield	Orford.	Howley.	St. Austin's	Latchford.	Walked into the Town.	Treated at Work-house.		Aikin Street.	Hope.		Hospit'l	Home.
1892—July 30 ...	—	—	—	—	—	—	—	*1	—	—	—	1	1	—	—	1	—
„ August 6 ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
„ „ 13 ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
„ „ 20 ...	—	4	—	—	—	—	—	1	—	—	1	5	4	—	—	—	—
„ „ 27 ...	1	5	—	1	—	1	—	1	—	—	—	9	7	—	2	1	—
„ September 3 ...	—	6	—	—	—	—	—	—	—	—	—	6	5	—	1	1	—
„ „ 10 ...	3	17	2	—	—	—	1	1	1	—	4	25	3	—	7	—	1
„ „ 17 ...	2	10	1	1	1	—	1	—	1	—	—	17	—	—	7	—	—
„ „ 24 ...	9	12	1	—	—	1	—	2	1	—	—	26	—	47	—	—	—
„ October 1 ...	2	15	1	3	2	—	2	—	3	—	—	28	—	27	1	3	—
„ „ 8 ...	3	14	3	2	2	1	1	4	1	—	1	31	—	30	—	2	—
„ „ 15 ...	2	7	9	1	—	2	1	6	—	—	—	28	†1	26	—	3	—
„ „ 22 ...	3	3	10	5	1	13	2	—	—	—	2	37	1	31	2	2	2
„ „ 29 ...	1	4	6	3	1	10	2	—	1	—	—	28	1	28	1	6	—
„ November 5 ...	2	—	9	8	—	4	—	3	2	—	—	28	—	25	2	1	1
„ „ 12 ...	8	5	16	11	2	25	8	1	2	1	—	79	—	50	13	5	—
„ „ 19 ...	5	3	11	5	1	8	3	—	1	—	—	37	1	40	9	4	4
„ „ 26 ...	1	2	7	6	1	4	2	—	—	—	—	23	1	14	5	3	1
„ December 3 ...	3	3	9	2	2	5	5	—	2	—	—	31	1	27	7	3	1
„ „ 10 ...	—	1	4	4	—	4	9	1	1	—	—	24	1	23	1	1	1
„ „ 17 ...	—	—	1	2	—	5	2	—	2	—	—	12	—	13	—	3	1
„ „ 24 ...	1	—	2	2	—	2	2	1	—	—	—	10	—	9	1	4	—
„ „ 31 ...	—	—	1	—	1	1	1	1	—	—	—	5	—	6	—	—	—
1893—January 7 ...	—	—	2	3	—	—	—	—	1	1	—	7	—	7	—	—	—
„ „ 14 ...	—	—	3	2	1	1	1	—	—	1	—	9	—	9	—	—	—
„ „ 21 ...	3	—	3	2	—	1	2	1	—	—	—	12	—	12	—	—	—
„ „ 28 ...	4	—	1	2	2	1	1	1	—	—	—	12	—	12	—	—	—
„ February 4 ...	—	2	—	—	—	—	2	2	—	—	—	6	—	6	—	—	—
„ „ 11 ...	—	2	—	2	1	—	—	1	2	—	—	8	—	8	—	—	—
„ „ 18 ...	2	—	—	1	—	—	2	—	—	1	—	6	—	5	1	—	—
„ „ 25 ...	1	2	—	—	—	—	1	2	—	—	—	6	—	6	—	3	—
„ March 4 ...	—	1	—	1	—	—	1	—	2	1	—	6	—	6	—	1	—
„ „ 11 ...	1	2	1	4	—	—	—	—	—	—	—	8	—	8	—	—	—
„ „ 18 ...	1	1	—	1	—	4	—	—	—	—	—	7	—	7	—	1	—
„ „ 25 ...	—	—	—	5	—	1	—	—	—	—	—	6	—	6	—	—	—
To end of March ...	—	1	1	3	3	2	—	2	1	2	—	15	—	15	—	—	—

Table IIIb.

Showing the incidence and fatality at different ages, with percentages of the same, up to the end of March, 1893.

	ALL CLASSES.			VACCINATED.			UNVACCINATED.		
	Attacks.	Deaths.	Fatality per cent.	Attacks.	Deaths.	Fatality per cent.	Attacks.	Deaths.	Fatality per cent.
Under 1 year	10	9	90·	...	...	...	10	9	90·0
1 year and under 5 years...	10	3	30·	3	...	...	7	3	42 8
5 years „ 10 „ ...	37	2	5·4	21	...	...	16	2	12·5
10 „ „ 20 „ ...	159	4	2·5	145	1	0·6	14	3	21·4
20 „ „ 30 „ ...	210	13	6·2	201	8	3·9	9	5	55·5
30 „ „ 40 „ ...	111	19	17·1	104	15	14·2	7	4	57·1
40 „ „ 50 „ ...	38	8	21·05	34	6	17·6	4	2	50·0
50 „ „ 60 „ ...	13	1	7·7	12	1	8·3	1	...	...
60 „ „ 70 „ ...	7	1	14·2	7	1	14·3	...	...	...
70 „ and upwards.....	1	...	...	1	...	...	...	...	...
Age not known	2	...	...	2	...	...	...	...	...
Totals.....	598	60	10·03	530	32	6·04	68	28	41·1
Per cent. under 10 yrs. of age	9·5	23·3	...	4·5	...	...	48·5	50·	...
Per cent. over 10 „ „	90·5	76 7	...	95·5	100	...	51·5	50·	...

The Percentage Fatality may be, perhaps, more strikingly exhibited in the following age-periods:—

AGES.	All Classes.	Vaccinated.	Unvaccinated.
	Fatality per cent.	Fatality per cent.	Fatality per cent.
0 — 5	60·	...	70·5
5 — 10	5·4	...	12·5
10 — 20	2·5	0·6	21·4
20 — 30	6·2	3·9	55 5
30 and upwards.	16·8	14·3	50·0

In the above enumeration the two deaths of persons, whose vaccination has elsewhere been regarded as doubtful, have been counted among the unvaccinated class.

The ages of the successfully *re-vaccinated in previous years* were as follows:—

20	—	30	... ...	2 cases.	Fatality, *nil.*
30	—	40	... ...	2 „	
40	—	50	... ...	1 „	
50	—	60	... ...	— „	
60	—	70	... ...	1 „	

Warrington, as I have said earlier on, is not a centre of the opponents of Vaccination, and there is no reason to suppose that the laws relating to the practice have been less efficiently carried out than in other parts of the country, though that, perhaps, is not saying very much. Still, a great deal of carelessness and evasion of the law exists, and has contributed to the disastrous results of the epidemic, though I must say that, at any rate as regards Warrington, the number of unvaccinated persons in it would form no just measure of the efficiency of the local authority in enforcing the practice, but rather of the unsatisfactory nature of the law, which leaves so many loopholes of escape from the obligations which it imposes, and makes no provision for any regular inspection of the population such as has been carried out with regard to the schools during the last few months. Without some means of examining, from time to time, the children in the town, there must always be a considerable number who escape being vaccinated, for the continual immigration into the place of people attracted by the chances of remunerative employment which the local manufactures afford, means their bringing in infants not yet vaccinated. The authorities of the place where the child's birth was registered are, of course, responsible for securing its vaccination, but when it is removed from there within the first few months of life, it passes out of their jurisdiction, and, of course, nothing being known of its existence by the Vaccination Officer here, it will never be done, unless the parents are alive to their duty. Unfortunately, many of them are not, and it is generally to such neglect that the non-vaccination of children is due. In some cases, on the other hand, there is opposition by the parents; in others, the operation is deferred or not carried out because of ill-health; in others again, the child has been declared insusceptible to vaccination by a medical man. A few such have been *successfully* vaccinated recently.

Examination of the Schools.

The examination of the state of the school children in the town was projected at an early date of the epidemic, but in consequence of stress of work, and in view of the other powerful stimuli to drive people to vaccination already being applied, it was not completed till the worst was over.

The incidence of Small-pox upon Children has, as we know, been comparatively slight, though its results in unvaccinated persons of this class have been disastrous enough. The value, therefore, of the details as to the vaccinated state chiefly consists in its showing, on the one hand, the proportion who have escaped the requirements of the law, and, on the other, demonstrating how far the medical profession carry out the operation efficiently.

Public Vaccinators are, of course, under the supervision of the Local Government Board, and obliged to follow its directions issued in

1887, to insert lymph in four separate places so as to produce scars of an aggregate foveate area of half a square inch. All experience goes to show that the protection afforded by vaccination depends upon the degree of inoculation, and repeated observations of cicatrices, measured both as to area and number, have led the Local Government Board to insist upon the above as a minimum requirement in case of primary vaccination, when the operation is done by officers under their inspection. These facts are, of course, well known to every medical man, but many are, unfortunately, ready rather to please their patients than to give them the best security from Small-pox.

The statistics,which I give below (Tables IV., IV A., IV B.) deal with 7,522 children, and seeing that the number of persons under 10 years of age in the borough is about 13,000, ought to give us a fair idea of the vaccinated state of the younger portion of the population. Unfortunately, at the time when a good many of the schools to which they refer were examined, the state of panic which prevailed in the town had led many parents to keep their children at home, so that the attendance was very small; many thus escaped observation.

The influence which fear had in causing parents either to make amends for their neglect, or to overcome their prejudices, is clearly seen in the number classed as cases of recent primary vaccination. These are comparatively few in the schools of which the inspection was made in October; probably a goodly addition could be made to them, were it repeated now. However, in estimating the number of unvaccinated children, those done in consequence of the panic must be included, for the law which ordains vaccination before the age of three months must necessarily have not been carried out. On the other hand, those recently done might be rightly included in an enumeration of the children as regards the number of marks. Such are the principles I have acted upon in constructing the Table of Percentages.

It has been my endeavour to separate the infant departments, so far as possible, from the older ones, in order to gain some idea if there has been any change in the efficiency of vaccination in Warrington in the direction either of improvement or of deterioration. In the majority of schools this has been possible, though in others one could not avoid summing up all ages together. The period which has elapsed since the Local Government Board has insisted on a minimum of four insertions of lymph, corresponds approximately to the age of the oldest children in the infant departments.

An inspection of the figures clearly reveals an extension of efficient vaccination among infants as compared with older children, for we find a general diminution in the proportions of them having three, two, and one marks respectively, most markedly in the case of those having two marks, with an equivalent increase in those with four. The ratio, to each class, of the unvaccinated children does not appear to have altered considerably.

Table IV.

Being a Statement of the results of personal inspection of Children in the different Schools, with regard to Vaccination, and giving the numbers with 1, 2, 3, &c., marks.

Name of School.	Vaccinated In Infancy. Number of Vaccination Marks.					Recent Primary Vaccination. Number of Vaccination Marks.				Unvaccinated.	Total.	Number Revaccinated.
	V.	IV.	III.	II.	I.	IV.	III.	II.	I.			
The People's College, Cairo Street, Infants	—	16	25	55	9	—	—	—	—	4	109	—
The People's College, Bank Quay, Infants	—	34	43	70	19	2	—	3	—	8	179	—
The Wycliffe, Infants	—	24	26	33	5	—	—	—	—	7	95	—
The National „	—	56	68	66	33	—	—	1	—	6	230	4
Heath Side „	—	27	34	40	17	—	—	—	—	6	124	—
St. Anne's „	—	7	44	24	16	—	—	2	—	2	95	2
Silver Street „	—	47	108	77	17	1	—	—	—	30	280	—
King Street „	—	34	20	18	4	4	—	2	—	5	87	—
St. James' „	—	46	35	47	8	—	2	—	—	16	154	—
Wash Lane „	—	37	21	39	10	—	—	4	3	12	126	2
Cockedge „	—	91	39	26	7	—	2	—	—	8	173	—
Trinity „	2	66	92	62	21	1	—	2	1	12	259	—
Hamilton Street „	—	67	42	41	11	—	3	—	—	11	175	—
St. Barnabas' „	—	50	15	24	8	—	—	—	—	4	101	—
St. Mary (R.C.) „	—	78	44	37	6	1	2	—	—	10	178	—
	2	680	656	659	191	9	9	14	4	141	2365	8

The People's College,	Boys	—	21	75	204	74	1	1	3	—	11	390	116
„	Girls	—	10	50	159	32	—	2	2	—	5	260	71
Wyeliffe, Mixed		—	14	92	150	46	1	1	1	—	14	319	59
National		—	19	98	143	57	—	1	—	—	30	357	3
The Mount, Mixed		—	88	158	253	38	—	5	7	3	7	559	48
Heath Side,	Boys	2	25	138	93	40	1	—	—	—	27	326	3
„	Girls	—	13	72	97	17	2	2	3	1	12	219	17
St. Anne's		—	26	71	58	33	1	—	—	—	19	208	4
St. Peter's, Mixed		—	28	49	56	11	1	2	3	—	5	155	16
King Street	Boys	—	16	36	43	18	—	1	3	2	6	125	10
„	Girls	—	8	38	44	7	—	—	—	—	4	101	8
St. James', Mixed		—	14	126	118	23	—	1	—	—	13	295	9
Wash Lane.		—	18	46	99	24	—	—	—	1	9	197	31
St. Mary's, Latchford		—	8	33	34	18	—	—	—	—	5	98	3
Trinity	Boys	1	21	61	49	9	—	—	—	—	5	146	—
„	Girls	—	18	19	31	3	—	—	—	—	4	75	—
Hamilton Street	Boys	1	19	90	108	25	1	2	12	—	16	274	25
„	Girls	1	27	57	97	25	1	4	9	—	5	226	13
St. Barnabas'		—	12	51	64	28	—	—	1	—	10	166	—
St. Mary's (R.C.)	Boys	—	17	66	64	19	2	3	1	—	17	189	5
„	Girls	—	25	67	56	7	2	2	—	—	4	163	4
Ladies' Charity		—	15	55	70	17	4	—	1	—	4	166	20
Grammar School		—	4	6	34	7	1	—	3	2	2	59	—
Children in Fever Hospital		—	31	20	24	6	—	—	—	—	3	84	—
		5	497	1574	2148	584	18	27	49	9	246	5157	465

occurred in the case of a man suffering from an obscure affection resembling the early stages of mild Small-pox, which there was every reason to suppose it was. The progress of the illness during the two days following admission led to some doubts, and, as is always done in dubious cases, he was vaccinated—but unsuccessfully, and a repetition of the operation fared no better. He was attacked with Small-pox a fortnight after admission, but luckily only with a mild form of the disease: this failure may be rightly attributed either to the lymph or to myself, the vaccinator.

I consequently feel considerable hesitation in believing in many of these cases of Small-pox after vaccination in early life. The history of many is founded on misstatement and presumptuous ignorance, such as was well shown in a case I recently investigated. A child in an invaded house, not itself a sufferer, was said to have had Small-pox at the age of five, having been vaccinated in infancy. On inquiry, I learnt from the mother that it had been the only case in the house; and the disease was not present in the town at the time: "* * *," she said, mentioning a well-known practitioner, "said it was Chicken-pox, but we knew better."

I append an account of previous attacks of Small-pox, so far as I have been able to ascertain their history.

1. Edwin T. B——, æt. 35, 8, Howard Street, vaccinated in infancy, has three marks; said to have had Small-pox at the age of four; the only case in the house; has one pit on the face, such as are common after Chicken-pox; had a very mild attack in August, 1892; re-vaccinated then after infection.

2. Mary M——, æt. 29, 39, Ellesmere Street; UNSUCCESSFULLY vaccinated in infancy; said to have had a slight attack 15 years ago in Birkenhead; had severe confluent Small-pox in 1892, with considerable pitting.

3. Jane H——, æt. 32, 341, Winwick Road; stated by her relatives to have had four vaccination marks, of which two only were seen in Hospital: also said to have had Small-pox in childhood; died of confluent Small-pox in 1892.

4. Annie H——, æt. 45, 15, Hopwood Street; vaccinated in infancy with two marks of two-fifths square inch total area; had an exceedingly mild attack in 1892, of which the rash appeared eight days after re-vaccination; is said to have had a previous attack at the age of 10, described as much milder than the present; six other inmates of her home had the illness at the same time; all children; all vaccinated; none severe; none pitted.

5. Alice B——, æt. 33, 5, Stamford Street; vaccinated in infancy with two marks of good quality; said to have had Small-pox at the age of 10; has several pits on the arms dating from that time; had a very slight attack in 1892.

6. Thomas H——, æt. 39, 2, Buckley Street; never vaccinated; had Small-pox at the age of three; had a very slight attack in 1892.

7. Thomas B——, æt. 56, 5, Stamford Street; said to have had Small-pox at the age of six; not pitted; was vaccinated in infancy, and has two inferior cicatrices; had a moderately severe attack in 1892.

8. John G——, æt. 26; has three fovcate marks of an aggregate area of one square inch; said to have had Small-pox at the age of one year, some months after vaccination: has numerous pits on the face and arms; had a mild attack in 1892.

9. Elizabeth A——, æt. 57, 99, Howley Lane; said to have been vaccinated in infancy; has two very faint small marks; said to have been attacked with Small-pox at the age of three, and to have been pitted; but the severe attack she had in 1892 prevented this being seen.

10. Ruth B——, æt. 23, 16, Lilford Street; vaccinated in infancy; has three foveate marks of nearly one square inch total area; said to have had Small-pox at the age of 12 months; a slight attack with six spots, and no pitting; the only case in the house; had a very mild attack in 1892.

11. William C——, æt. 26, 15, Academy Street; vaccinated in infancy; has two foveate marks, equal to about one square inch in total area; said to have had Small-pox at the age of five; three brothers and three sisters had it at the same time; all vaccinated; all mild; none pitted; had discrete Small-pox in 1892.

12. Catherine K——, æt. 59; Old Barracks; never vaccinated; had Small-pox at the age of eight; had a very mild attack in 1893.

I do not propose to offer any comment on the above cases, except by saying that the youngest vaccinated child we have seen with Small-pox has been five years of age, and its attack of the mildest possible description, leaving no trace whatever of marks, and that deep pits are not infrequently left by a disease often very difficult to distinguish from the milder cases of Variola—Chicken-pox, of which probably most of these said previous cases were examples.

I may here appropriately refer to a case which was reported at some length in the *British Medical Journal* for 11th February, 1893:—An unvaccinated child, hailing from Leicester, taken ill five days after arrival in Warrington, and notified and sent to the Hope Hospital as suffering from Small-pox, was found on admission to have an eruption, which though indistinguishable from Small-pox, was not only less copious, but attended with much less constitutional disturbance than our experience of Variola in unvaccinated children would have led us to expect. The child was accordingly put under the test and protection of vaccination, lymph being inserted in five places successfully. We were fortunate in two respects here:

(1.) We proved that the child was suffering from Chicken-pox —not Small-pox —for, as our experience helps to prove, vaccinating a person already having Small-pox out upon him is invariably a failure; the patient in such a condition is insusceptible.

(2.) We prevented it taking Small-pox; it left the Hospital five weeks after without any signs of that disease, and in excellent health.

It was kept in so long, because the vaccination having taken rather severely, it was desired not to give the anti-vaccinators any handle, which might have been done had it been discharged before healing was complete, and something gone wrong with the arm.

Small-pox in Children.

A comparison of the attack rates and fatality in children, vaccinated and unvaccinated, gives us at once the most striking picture of the immunity enjoyed by the former, and of the dreadful effects upon the latter of this disease. We have already given some idea of the effect of vaccination in preventing the attack. The tabulated account of all children who have had Small-pox which I give in Tables VI. and VII. will serve to illustrate many points of importance, and if any argument can possibly convince an anti-vaccinator, let him that has eyes to see look upon it.

I propose to treat as unvaccinated, all persons on whom the operation was performed during the incubation period, that is after infection by Small-pox—but as I give the details, all, to whom this arrangement appears unsatisfactory, will have the opportunity of counting them on the other side. By far the greater number of these were infants, and died, and an account of them will be found in Table X. But there *also* were a few people over 10 years of age, vaccinated for the first time too late, about whom I may as well speak now. They were as follows:—

Cases of Small-pox after recent Primary Vaccination.

Hannah R. C——, æt. 10, 35, Wakefield Street; vaccinated 11 days before the rash; had a very mild attack.

Joseph B——, 13, Sandhill Terrace, Latchford; æt. 25; certified as insusceptible in infancy; vaccinated 10 days before the rash; had a very mild attack.

James M——, æt. 20, 3, Antrobus Street; vaccinated eight days before the rash; had a very severe attack of confluent Small-pox.

The above three were all done successfully; in another one unsuccessfully, there is some doubt as to whether he had been vaccinated in infancy.

Peter K——, 3, Morris's Yard; aged 37; had the discrete variety of the disease.

Table VI.

A List of Unvaccinated Children under 10 years of age who had Small-pox (including several Vaccinated too late, that is after the Infection).

	NAME.	ADDRESS.	Age.	VACCINATION.	SMALL-POX.	
					Character of Case.	Results, &c.
1	James M.	42, Howard Street	2 weeks	Unvaccinated	Confluent	Died
2	Emily W.	16, Howard Street	8 years	Unvaccinated (vaccinated the day before the rash)	Discrete	Slight pitting about the face.
3	Walter L.	Heathside	5 ,,	Unvaccinated	Confluent	Slight pitting.
4	Joseph H.	15, Hopwood Street	5 ,,	Unvaccinated	Confluent	Not pitted.
5	Joseph B.	16, Owen Street	7 ,,	Unvaccinated	Confluent	A severe & protracted case, with considerable pitting of hands and face.
6	Robert A. G.	36, Allcard Street	35 days	Unvaccinated	Confluent	Died.
7	Alice M.	2, Foundry Street	6 weeks	Unvaccinated (vaccinated four days before rash)	Confluent	Died.
8	Frank H.	53, Winwick Road	4 years	Unvaccinated	Confluent	Not pitted.
9	George H.	14, Watkin Street	8 ,,	Unvaccinated	Confluent	Severe case with ulceration of cornea, but no pitting.
10	Michael K.	16, Jones's Buildings	5 ,,	Unvaccinated	Confluent	Slight pitting and ulcera- of cornea.
11	Mary M.	36, Pierpoint Street	4 ,,	Unvaccinated	Confluent	Severe case; pitting of face.

TABLE VI.—*Continued.*

	NAME.	ADDRESS.	Age.	VACCINATION.	SMALL-POX.	
					Character of Case.	Results, &c.
12	Sarah M.	36, Pierpoint Street.....	8 years ...	Unvaccinated	Confluent	Died.
13	John T.	17, Orchard Street	8 „ ...	Unvaccinated	Confluent	Not pitted.
14	Ann H.	1, Frederick Street	10 days ...	Unvaccinated	Confluent	Died (rash day after birth).
15	William B.	2, Back Hopwood Street.....	11 „ ...	Unvaccinated (vaccinated a week before rash)	Confluent	Died.
16	Thomas K.	3, Morris's Yard	9 years ...	Unvaccinated	Confluent	Not pitted.
17	William J. M. ...	39, Rose and Crown Street...	3 „ ...	Unvaccinated	Confluent	Died.
18	Mary M.	5, Dolman's Lane.....	3 „ ...	Unvaccinated	Confluent	Died.
19	Joseph T.	3, Nicholson Street	5 „ ...	Unvaccinated	Discrete.....	Not pitted.
20	Thomas H.....	5, School Brow.....	5 „ ...	Unvaccinated	Confluent	Severe case; numerous abcesses during convalescence.
21	Gladys H.	85, Cartwright Street	1 month...	Unvaccinated	Confluent	Died.
22	John C.	37, Warburton Street	5 years ...	Unvaccinated (vaccinated seven days before rash)	Discrete.....	Not pitted.
23	John W. H.	16, Ellesmere Street.....	11 weeks	Unvaccinated (vaccinated the day before the rash)	Confluent	Pitted about forehead.
24	Mary E.	2, Antrobus Street	4 days ...	Unvaccinated (vaccinated four days before rash)	Confluent (hæmorrhagic)	Died.
25	John C.	9, Napier Street	13 „ ...	Unvaccinated	Confluent	Died.
26	Austin M.	54, Academy Street.....	9 years ...	Unvaccinated	Confluent	Not pitted.
27	Henry T.	1, Knight's Yard	1 year 5 months	Unvaccinated (vaccinated five days before rash)	Confluent	Died.
28	Stanley M.....	9, Sharpe Street	4 years ...	Unvaccinated.....	Confluent	Severe case; no pitting, but loss of hair.
29	Sarah J. B.	Glass House Square.....	5 „ ...	Unvaccinated	Discrete.....	Not pitted.
30	Sarah P.....	2, Spencer's Yard.....	9 „ ...	Unvaccinated	Discrete.....	Not pitted.
31	Mary C.....	Workhouse	1 yr. 8 mths.	Unvaccinated	Discrete.....	Not pitted.
32	Percy S.	8, Brierley Street	17 days ...	Unvaccinated (vaccinated eight days before the rash)	Modified	Died. *Vide* more detailed account

Table VII.

A List of Vaccinated Children under 10 who had Small-pox.

No.	NAME.	ADDRESS.	Age.	VACCINATION.	SMALL-POX.	
					Character of case	Results, &c.
1	Hetty Ll.	Aikin Street Hospital ...	9	Vaccinated in infancy	Mild	Slight case; no pitting.
2	Joseph A.	Workhouse	4	Vaccinated in infancy	Mild	Slight case; no pitting.
3	Thomas B.....	19, Howard Street	9	One mark of small size (area 1-9th sq. inch.)	Mild	Very slight; no pitting.
4	Walter S.....	58, Howard Street	9	Four small marks (aggregate area ½ sq. inch.)	Mild	Very slight; no pitting.
5	James L.	Iee Cottage. Heathside..	7	Said to have been vaccinated, but having no traee of marks	Confluent	Died.
6	Henry P.	72, Howard Street	7	Two small marks (aggregate area ⅓ sq. inch).....	Mild	Very slight; no pitting.
7	Joshua W.....	2. Rolleston Street	8	Three foveate marks (aggregate area 1¼ sq. inch.	Mild	Very slight; no pitting.
8	Anne P.	67, Legh Street.....	8	Two marks (aggregate area ⅓ sq. inch)	Discrete.....	Slightly pitted.
9	Mary A. M. ...	15, Derby Street	4	Two good marks.....	Mild	About six spots.
10	John A. C. ...	35, Wakefield Street ...	4	Three good marks	Mild	Exceedingly slight.
11	Edith H.	42, Nicholson Street.....	9	Three foveate marks (aggregate area ⅓ sq. inch)	Semi-confluent ...	Numerous small pits on face
12	Lilly H.	42, Nicholson Street.....	7	Two foveate marks (aggregate area 2-5ths sq. inch)...	Mild	No pitting.
13	Joseph R	11, Glasshouse Row.....	9	Two faint marks.....	Semi-confluent ...	
14	Richard H. ...	15, Chorley Street.....	7	Three good marks	Mild	About half-dozen spots in all
15	Alice W.	42. Eustace Street.....	7	Three good marks	Mild	Very slight; no pitting.
16	John H.....	25, Philip Street	8	Three foveate marks (area 2-5ths sq. inch).....	Mild	No pitting.
17	Catherine M....	106. Pierpoint Street ...	8	Three faint marks	Mild	Very slight; no pitting.
18	John M.....	106, Pierpoint Street ...	6	Three good marks	Mild	Very slight; no pitting, 16 spots in all.
19	Gertrude K. ...	2. Edward Street.....	7		Mild	No pitting.
20	Samuel H.....	52. Turner Street.....	8	Three foveate marks (aggregate area 2-5ths sq. inch)...	Mild	Very slight; 60 small poeks. no pitting.
21	John B.....	23, Stamford Street.....	9	Four marks foveate (aggregate area ⅓ sq. inch).....	Mild	Very slight; 12 spots in all. no pitting.
22	Annie G.	1. Croppers Brow.....	8	Two very small non-foveate marks	Mild	About 20 spots.
23	David B.	The Workhouse	7	Three foveate marks (aggregate area ⅓ sq. inch).....	Mild	About 20 spots.
24	Marion H. ...	41. Lythgoes Lane	5	Four foveate marks (aggregate area 1 sq. inch).....	Mild	About six spots.
25	Annie M.	7 Elizabeth Street	7	Vaccinated in infancy	Mild	

TABLE IX.

Giving Particulars of Persons who died believed to have been Vaccinated in Infancy.

No.	Date of Death.	NAME.	Age	ADDRESS.	Occupation.	Vaccination.	Re-vaccination.	Character of Small-pox.	Length of Illness.	Where treated.	Previous health of deceased.	REMARKS.
1	2	3	4	5	6	7	8	9	10*	11	12	13
	1892.											
1	Aug. 30	John A. ...	31	17, Winwick Road	Labourer.....	Said to have had three small marks	Never	Confluent ...	10 days.....	Aikin Street Hospital	Alcoholic	Marks could not be seen.
2	Sept. 25	Samuel D. ...	58	14, New Road	File Cutter...	Had three faint cicatrices	,, ...	Do. ...	16 ,, ...	Hope Hospital		
3	,, 29	James L. ...	8	Ice Cottage, Heathside.....	Scholar	Said to have been vaccinated ...	,, ...	Do. ...	8 ,, ...	Do.		No trace of Scars could be discovered.
4	Oct. 10	Edward C. ...	40	14, Cockhedge	Ironworker...	Three cicatrices	,, ...	Do. ...	11 ,, ...	Do.	Alcoholic	Vaccination Scars could not be seen because of rash
5	,, 13	George W. ...	46	78, Howard Street	Roller (Whitecross)	Two cicatrices	,, ...	Do. ...	7 ,, ...	Do.	Alcoholic	
6	,, 17	William H. H.	36	4, Blue Coat Street.....	Toolmaker ...	Two small marks.....	,, ...	Malignant ...	3 ,, ...	Home		
7	,, 18	Joseph M. M...	34	2, Philip Street.....	Wiredrawer..	Two small marks.....	,, ...	Do. ...	2 ,, ...	Do.		
8	,, 25	Thomas B. ...	31	23, Howard Street	Carter	Two marks.....	,, ...	Confluent ...	8 ,, ...	Hope Hospital		
9	,, 25	James B. ...	27	154, Winwick Road	Gasworks ...	Two foveate marks of aggregate area ½ sq. inch	,, ...	Do. ...	6 ,, ...	Do.	Temperate, but subject to Bronchitis,	Complicated with severe Bronchits.
10	,, 27	Thomas E. ...	18	17, Turner Street.....	Hawker	Two marks.....	,, ...	Discrete	29 ,, ...	Do.		Died from Pyæmia.
11	Nov. 7	Peter N. ...	44	Tanners' Lane Lodging-House	Cooper.....	Said to have been vaccinated...	,, ...	Confluent ...	7 ,, ...	Do.	Alcoholic	No trace of Vaccination Scars could be discovered.
12	,, 9	William A. ...	41	115, Bostock Street.....	Clerk.....	One mark	,, ...	Do. ...	15 ,, ...	Do.		
13	,, 15	Alfred S. ...	28	62, Selby Street.....	Blacksmith..	Said to have had two small marks	,, ...	Do. ...	6 ,, ...	Home		
14	,, 15	George G. ...	20	62, Wellington Street	Shop Assistant	Said to have had two very small marks	,, ...	Do. ...	9 ,, ...	Do.		
15	,, 17	James E. ...	36	77, Chorley Street	Enginedriver	Said to have had two small marks	,, ...	Do. ...	8 ,, ...	Do.		
16	,, 19	Jabez A. ...	42	80, Longford Street.....	Foreman Shunter	Said to have had three marks	,, ...	Do. ...	12 ,, ...	Hope Hospital		Ill seven days previous to admission. Vaccination marks obscured by rash.
17	,, 20	Percy S. ...	26	3, Appleton Street	Boilermaker	Two marks.....	,, ...	Do. ...	8 ,, ...	Do.		
18	,, 29	William M. ...	32	44, Pierpoint Street.....	Ironworker...	Two marks.....	Eight days before the rash—successfully	Do. ...	9 ,, ...	Do.		
19	Dec. 4	James L. ...	49	4, Mill Street.....	Greengrocer	Two very doubtful small marks	Never	Do. ...	18 ,, ...	Do.	Alcoholic	Died of Acute Mania comiug on during convalescence from Small-pox.
20	,, 12	John A. ...	37	35, St. Mary's Street	Book-keeper	Two faint marks	,, ...	Do. ...	10 ,, ...	Home	Alcoholic	
21	Nov. 29	G. H. E. ...	39	79, Buttermarket Street ...	Stonemason	One mark	,, ...	Malignant ...	2 ,, ...	Do.		
22	,, 15	John W. ...	24	24, Pinner's Brow	Enginedriver	Said to have had two marks...	,, ...	Confluent ...	10 ,, ...	Hope Hospital		Admitted to Hospital after being ill six days. No vaccination marks could be seen because of rash.
	1893.											
23	Feb. 23	James A. ...	49	31, Factory Street	Foreman at Engine shed L. & N.W.R	Two non-foveate marks of aggregate area 1-3rd sq. inch	,, ...	Do. ...	4 ,, ...	Do.	Alcoholic	Had been drinking heavily three weeks.
24	,, 26	John B. ...	35	14, King Street	Cabdriver ...	One foveate mark of area 1-9th sq. inch	,, ...	Malignant ...	24 hours ...	Do.	Alcoholic	
25	April 27	Arthur T. ...	40	103, Winwick Road	Fitter, Dallam Wireworks	Two foveate small marks	,, ...	Do. ...	5 days.....	Do.	Good generally, but overworked lately.	
26	,, 21	John M. ...	9	54, Pierpoint Street		Said to have been vaccinated...	,, ...	Confluent ...	6 days.....	Do.	Delicate.	Complicated with broncho-pneumonia.
	1892.											
1	Oct. 6	Margaret C. ...	39	14, Cockhedge	Domestic.....	Two faint marks	Never	Confluent ...	9 days.....	Hope Hospital	Alcoholic	
2	,, 7	Martha Y. ...	25	Aikin Street	Fustiancutter	Three good marks	,, ...	Do. ...	12 ,, ...	Do.		
3	,, 21	Martha M. ...	36	2, Philip Street.....	Domestic.....	Three faint marks	,, ...	Do. ...	6 ,, ...	Do.		
4	,, 23	Jane H. ...	32	341, Winwick Road.....	Do.	Said to have had four by relatives, but *two* only seen in Hospital	,, ...	Do. ...	10 ,, ...	Do.	Delicate	Complicated with abortion.
5	,, 27	Elizabeth C. ...	30	10, Orford Lane	Do.	One faint mark	,, ...	Do. ...	8 ,, ...	Do.		
6	Nov. 6	Barbara W. ...	21	18, Ellis Street.....	Do.	Two good marks	,, ...	Do. ...	7 ,, ...	Do.	Chronic Rheumatism.	Heart Disease. Fatal Syncope.
7	,, 9	Jane J. ...	38	49, Chorley Street	Do.	Two non-foveate marks about half sq. inch in total area	,, ...	Do. ...	4 ,, ...	Do.	Alcoholic	
8	,, 19	Sarah G. ...	36	133, Winwick Road.....	Do.	Three good marks	,, ...	Do. ...	8 ,, ...	Do.	Chronic Invalid	
9	,, 21	Sarah A. H. ...	22	1, Frederick Street.....	Do.	Two small marks.....	,, ...	Do. ...	17 ,, ...	Home		Recently confiued.
10	Dec. 18	Sarah G. ...	64	79, Chorley Street	Do.	Four very faint small marks ...	,, ...	Do. ...	4 ,, ...	Hope Hospital		Complicated wtih Broncho-pneumonia.
	1893.											
11	May 6	Elizabeth H. ...	24	93, Cartwright Street.....	Do.	Two non-foveate marks 2-3rd inch total area.	,, ...	Do. ...	11 ,, ...	Do.	Good	Complicated with Broncho-pneumonia.

The Length of Illness has generally been dated from the rash an inconsistency, which ought to have been avoided.

Table X.

Giving particulars of Persons who Died belonging to the Unvaccinated Class.

No.	Date of Death.	NAME.	Age.	ADDRESS.	Occupation.	Vaccinated.	Character of Small-pox.	Length of Illness.	Where treated.	Previous health of Deceased.	REMARKS.
	1892										
1	Aug. 5	William R. ...	27	Of Cardiff, Lodging House, Friars' Green		Unvaccinated.	Confluent.		Aikin Street.		
2	,, 26	Harry B. ...	10	8, Howard Street		Do.	Do.		Do.	Good.	
3	Sept. 6	James M. ...	20 days	42, Howard Street		Do.	Do.		Home.		
4	Oct. 4	Peter L. ...	20	Ice Cottage, Heathside ...	Fishmonger.	Do.	Do.	11 days.	Hope.		
5	,, 12	Robert A. G. ...	1 month	102, Catherine Street ...		Do.	Do	4 ,,	Do.		
6	Nov. 7	Thomas R. ...	15	77, Winwick Road	Tanners' Lane Tannery.	Do.	Do.	10 ,,	Do.		
7	,, 22	William B. ...	14 days	4, Brick Street		Vaccinated seven days before the rash.	Do.	8 ,,	Do.		
8	,, 23	William G. ...	28	50, Turner Street	Labourer.	Unvaccinated.	Do.	12 ,,	Home & Hope		Admitted two days before death.
9	,, 28	William J. M.	3	39, Rose and Crown Street		Do.	Do.	7 ,,	Hope.	Poor.	After discharge for Scarlatina from Aiken Street Hospital.
10	Dec. 10	Thomas R. ...	55	36, Ellesmere Street ...	Turner.	Do.	Confluent; hæmorrhagic.	5 ,,	Do.	Good.	Died four hours after onset of acute symptoms.
11	,, 18	Benjamin B. ...	22	139, Knutsford Road ...	Butcher.	Do.	Confluent.	14 ,,	Do.	Good.	Father travelled about the country, and so the son was neglected.
12	,, 21	Henry T. ...	15 12	1, Oliver Street		Vaccinated five days before the rash.	Do.	2 ,,	Do.		Oedema glottitis.
13	,, 16	John C. ...	13 days	9, Napier Street		Unvaccinated.	Do.	2 ,,	Do		Four hours after admission to Hospital.
14	,, 21	James T. ...	33	1, Oliver Street		Do.	Do.	2 ,,	Do.	Phthisis.	Had advanced Phthisis of both lungs.
	1893										
15	Feb. 22	John W. ...	18	Daly's Lodging House ...	Labourer.	Do.	Do.	10 ,,	Do.		A negro from Jersey state. In Warrington three weeks.
16	,, 23	Percy S. ...	17 days	8, Brierley Street		Vaccinated ten days before the rash.	Modified	4 ,,	Do.		Born prematurely; died from premature birth, with vaccination and modified Small-pox as contributory causes.
	1892										
1	Oct. 31	Alice A. M. ...	1 month	2, Foundry Street		Vaccinated four days before the rash.	Confluent.	7 days.	Do.		
2	,, 28	Mary A. R. ...	43	53, Howley Lane	Domestic.	Unvaccinated.	Confluent; hæmorrhagic.	5 ,,	Do.		
3	,, 31	Elizabeth C. ...	39	18, Forshaw Street	Do.	Do.	Discrete.	7 ,,	Do.	Feeble.	
4	Nov. 3	Sarah A. M. ...	8	38, Pierpoint Street		Do.	Confluent.	8 ,,(circ)	Home.		Hastened by neglect of mother.
5	,, 14	Annie H. ...	10 days.	1, Frederick Street		Do.	Do.	13 ,,	Do.		Rash day after birth.
6	,, 13	Martha A. ...	28	6, Watkin Street	Fustian Cutter.	Do.	Do.	9 ,,	Hope.		
7	,, 29	Mary M. ...	3	Aikin Street Hospital ...		Do.	Do.	7 ,,	Aikin Street.	Good.	
8	Dec. 6	Gladys H. ...	1 month	35, Cartwright Street ...		Do.	Do.	7 ,,	Home.		
9	,, 21	Mary E. ...	4 days	2, Antrobus Street ...		Vaccinated four days before the rash in Hospital.	Confluent; hæmorrhagic.	6 ,,	Hope.		
	1893										
10	Mar. 22	Jane W. ...	34	31, Golborne Street ...	Domestic.	Unvaccinated.	Confluent.	9 ,,	Do.		Was never vaccinated, because her mother's medical attendant—Dr. Robson—was an anti-vaccinator.

Re-Vaccination.

The measures taken by the Medical Officer of Health, at the instance of your Committee, to promote re-vaccination, I have already detailed, as well as the awakening of employers of labour to the fact that their own financial interests depended on carrying out advice, which not a few people thought designed merely to benefit the pockets of the medical profession, and the influence of the scare in screwing up the courage of the public, and so I propose only to give a summary of results.

The number of people re-vaccinated during the panic was 16,902, and allowing for those done before and after, we cannot hesitate to believe that about a third of the population now enjoys an immunity which will remain absolute for a good number of years, indeed, in most cases for the rest of life. This enumeration includes:—

(881 done at Public Vaccination Station in Golborne Street.
1,482 at the Stations established by the Health Committee.
14,539 by private practitioners, of whom the great majority were workpeople done at the expense of their employers.)

At least, 17,000 persons therefore have been re-vaccinated in Warrington since July, 1892, of whom *not a single one* took Small-pox—granting that operation had been performed previously to his receiving the infection.

I have a complete list of persons re-vaccinated during the past year who suffered from Small-pox, and am fortunate enough to be able to furnish particulars of the dates of the eruption in each instance. An inspection of the table I give will suffice to show that in each case the disease had already been contracted; the period of incubation having an average duration of 13 days, *i.e.*, from receiving the infection to the appearance of the rash.

By far the greater number of re-vaccinations were performed at the expense of or under pressure from employers of labour, and as some of the works concerned have been specially exposed to infection, it is important to learn the experience there gained. With a view to ascertaining the manner in which re-vaccination was brought about, I wrote to several of the leading firms asking what measures they had taken to this end, the number of their workpeople, and the proportion of them who underwent the operation. They have been so kind in most instances as to furnish me with all the particulars I desired. In some, all that was done was to offer to defray the expense of having the workpeople done; in others definite and reasonable length of time was given them to get done at the cost of the firm, after which anyone who took Small-pox would at once be dismissed altogether, in most instances sick pay being given to sufferers so long as they had fulfilled the conditions (this implies a considerable faith in vaccination—and one that events have shown not misplaced).

There are works which, from their great size, special exposure to danger, and the important part they have played, merit more de-

Table XI.

LIST OF PERSONS WHO HAD SMALL-POX AFTER RE-VACCINATION.

No.	NAME.	ADDRESS.	Age.	RE-VACCINATION. Date of Re-vaccination.	Remarks.	Date of Rash of Small-pox.	CHARACTER OF ATTACK.
1	Agnes L.	96, Priestley Street	48	Aug. 23, 1892...	Successful	August 31, 1892	Discrete.
2	Edwin Thomas B.	8, Howard Street	35	,, ,, ,, ...	Successful	September 2 ,,	Very mild.
3	Mary Ellen B.	12, Wakefield Street	35	Sept. 3, ,, ...	Unsuccessful	,, ,, ,,	Mild.
4	Annie S.	7, Aikin Street	22	,, 7, ,, ...	Unsuccessful	,, 20 ,,	Confluent.
5	Alice H.	42, Nicholson Street	35	,, 15 & 21 ,, ...	Took slightly second time	,, 24 ,,	Discrete.
6	Isaac S.	6, Hopwood Street	19	,, 23 ,, ...	Day of rash, unsuccessful	,, 28 ,,	Discrete.
7	Mary R.	Aikin Street Hospital	—	,, 20 ,, ...	Nine days before rash		Mild.
8	Martha W.	42, Cartwright Street	24	Oct. 7 ,, ...	Successful	October 13 ,,	Mild.
9	Faith H.	53, Winwick Road	36	,, 9 ,, ...	Successful	,, 18 ,,	Mild (very).
10	Annie H.	15, Hopwood Street	45	,, 20 ,, ...	Successful	,, 28 ,,	Very slight.
11	Arthur James N.	157 Winwick Road	24	,, 17 ,, ...	Successful	,, 25 ,,	Mild.
12	Joseph B.	13, Sandhill Terrace, Latchford	25	,, 23 ,, ...	Successful	,, 30 ,,	Mild.
13	Sarah Ann B.	25, Guardian Street	28	,, 22 ,, ...	Unsuccessful	November 2 ,,	Mild.
14	Joseph W.	12, Firth Place	26	Nov. 4 ,, ...	Successful	,, 7 ,,	Very mild.
15	James S.	34, Nicholson Street	21	,, 12 ,, ...	Successful	,, 15 ,,	Mild.
16	Florence Annie P.	20, Ashton Street	33	Oct. 31 & Nov. 14...	The second re-vaccination successful	,, 19 ,,	Confluent (pitted)
17	William M	44, Pierpoint Street	32	Nov. 13 1892...	Successful	,, 20 ,,	Confluent (died).
18	Mary Ann W.	15, Lythgoes Lane	35	,, 15 ,, ...	Successful	,, 21 ,,	Discrete.
19	Mary Ellen T.	62, Selby Street	25	,, 12 ,, ...	Successful	,, 20 ,,	Mild.
20	Margaret P.	13, Watkin Street	31	,, 15 ,, ...	Successful	,, 24 ,,	Mild.
21	Thomas R.	26, Kerfoot Street	17	,, 17 ,, ...	Successful	,, 23 ,,	Discrete.
22	Catherine B.	9, Watkin Street	26	,, 15 ,, ...	Successful	,, ,, ,,	Mild.
23	William A. H.	85, Cartwright Street	30	Dec. 1 ,, ...	Unsuccessful after recovery from Small-pox	,, 12 ,,	Mild.
24	Ruth B.	16, Lilford Street	23	Nov. 17 ,, ...	Unsuccessful	,, 18 ,,	Mild.
25	Mary Ann L.	1, Gas Street	33	,, 22 ,, ...	Successful	,, 30 ,,	Mild.
26	Peter K.	3, Morris's Yard	43	,, 21 ,, ...	Unsuccessful	December 3 ,,	Discrete.
27	Elizabeth D. C.	13, Orford Street	42	Dec. 6 ,, ...	Successful	,, 13 ,,	Discrete.
28	Elizabeth W.	45, St. Mary's Street, Latchford	34	,, 13 ,, ...	Unsuccessful	,, 29 ,,	Mild.
29	Kitty G.	45, Catherine Street	35	Jan. 5 1893...	Successful	January 15 1893	Mild.
30	Frank Smith W.	166, Forster Street	26	,, 11 ,, ...	Successful	,, 21 ,,	Mild.
31	Annie D.	166, Forster Street	28	,, ,, ,, ...	Successful	,, 22 ,,	Discrete.
32	David W.	107, School Brow	25	,, 23 ,, ...	Unsuccessful	,, 23 ,,	Mild.
33	Mary E. C.	Parker Street	24	Aug. 1892...	Unsuccessful. Had small-pox in	December 1892	Very mild.
34	Louisa H.	41, Lythgoes Lane	34	Mar. 7 1893...	Successful	March 8	Confluent.

tailed attention. The Dallam and Bewsey Forges, to which I refer, are situated on the opposite side of Dallam Lane to the Hope Hospital, which is near their Northern extremity, the greater part of them occupying an area which reaches some 500 yards from it to the South-west. They employ about 2,180 workpeople of all kinds (men and boys), and soon after the Hope Hospital was opened, whether in consequence of that or not, began to experience considerable difficulty from the Small-pox, and this, not only because of employés being themselves affected, but also through the existence of one case in a household necessitating the other members of it for a time being idle. The list I give of the weekly totals of cases made known to the Health Department, and of the numbers of them who worked at Dallam, will furnish some idea of the extent to which they suffered

TABLE XII.

Week Ending.	Total of Cases Notified.	Number of them who worked at Dallam.
Aug. 27	9	2
Sept. 3	6	1
„ 10	25	1
„ 17	17	0
„ 24	26	1
Oct. 1	28	0
„ 8	31	2
„ 15	28	2
„ 22	37	6
„ 29	28	4
Nov. 5	28	2
„ 12	79	30
„ 19	37	9
„ 26	23	7
Dec. 3	31	1
„ 10	24	2
„ 17	12	0
„ 24	10	0
„ 31	5	1
1893.		
Jan. 7	7	1
„ 14	9	0
„ 21	12	0
„ 28	12	0
Feb. 4	6	0
„ 11	8	1
„ 18	6	0
„ 25	6	0
March 4	6	0
„ 11	8	0
„ 18	7	1
To end of March	15	1
Total	592	75

The week ending November 12th thus marks a critical period in the history of Small-pox in this particular connection, and I myself feel no doubt that the general re-vaccination, to which this alarming increase gave rise, prevented the number stricken being very much larger. We have seen that in invaded houses the proportions of vaccinated adults who took Small-pox reached 27·5 per cent.: at Dallam, though in one week 30 were attacked, the total percentage up to the end of March, 1893, reached was not 4 per cent. of the whole number, though they are believed to have been specially exposed to the poison.

The Sick Fund, which forms such an important feature of the place, during the earlier weeks of the epidemic granted relief to all who were compelled in any way to be idle through the existence of Small-pox. When, however, some of the mills were in danger of stopping through the men themselves being stricken, it was resolved to grant no more sick pay to anyone who got Small-pox after 10 days from a fixed time, giving everyone ample time to be re-vaccinated. Out of the total 2,180, it is believed that not more than 20, in addition to those who had already recently had Small-pox, escaped re-vaccination. This was done during the latter part of November, and by the beginning of the following month the men had, with these few exceptions, been all rendered immune.

From this time forth the forgemen ceased to be important contributors to the number of new cases. We have had in all 80 (up to the date of writing) from among them; of these 67 were reported before the beginning of December; of these 3 had been re-vaccinated, one in August, the other two in November, all after infection; they are included in the list I have already given. Another was a young man, who had never been vaccinated at all, but was done for the first time in November, but only eight days before the rash; therefore after infection.

From December 1st to May 1st (the date of writing), 13 notified cases have been those of workers at Dallam: none of these were ever re-vaccinated; one of them had never been vaccinated at all; four are known to have obstinately refused to take this necessary precaution; two had been ill at the time they had the chance of doing so, and were excused; one had only joined the works in March; one had gone to be re-vaccinated too late; and the rest had evaded the requirements of their employers for unascertained reasons. One can say, therefore, without any hesitation, that it has been the residuum, who did not choose to follow the course, which they were advised to do, who got Small-pox.

Now, whatever the *modus operandi* of the Hope Hospital as a centre of infection, the majority of these 2,180 workmen lived in close proximity to it, and those who did not had daily to come near it. I do not, therefore, think I am wrong in believing that the public spirit shown in enforcing re-vaccination has saved an immense amount of suffering, and probably many lives. Vaccina-

tion carried on on such a huge scale, and in such a hurry, must necessarily in itself be more liable to untoward complications than were it done under more favourable circumstances. I was therefore anxious to ascertain the extent to which it had incapacitated men for work, and inquired how many were off for more than four days in consequence. The number who were thus invalided was 66, one for as many as 12 days, the rest for six or seven; though, despite this, neither employers nor workmen feel any regret in having taken the course they did. With how much less trouble could equally desirable results be obtained were re-vaccination universally enforced!

In the case of Messrs. Walker's Brewery, also situated within the area that has had the worst experience—out of a total of 379, 42 only were excused by the doctor; 7 cases of Small-pox occurred there, confined to the non-re-vaccinated, the last one being notified on November 10th. At the Cockhedge Mills of Messrs. Armitage and Rigby, out of a total of 1,400, 1,047 were re-vaccinated at the expense of the firm, while of the remaining 353 many had already had it done on their own account, and others were excused on the ground of old age or chest affections, the only causes for exemption admitted. Nine cases of Small-pox occurred there, notified as follows: 4 in September, 3 in October, 1 on November 2nd, before the re-vaccination period, and 1 in January—an odd hand who had not been working there at that time, and so escaped receiving protection.

TABLE XIII.

FIRM.	No. of Work-people.	No. re-vaccinated.	No. who had Small-pox.	REMARKS.
1. Dallam & Bewsey Forges	2180	2160	80	Under presure.
2. Dallam Lane Wire W'ks	120	?	6	No compulsion.
3. Longford Wire Works...	150	149	3	At expense of firm.
4. Peter Walker & Son ...	379	337	7	42 excused by Medical Officer. At expense of firm.
5. Messrs. Waring & Co.'s Tannery, Dallam Lane	50	?	0	No compulsion.
6. London & North-Western Railway (engine sheds)	254	?	12	No compulsion.
7. Tanners' Lane Tann'g Co.	60	56	1	At expense of firm.
8. Rylands Bros., Limited..	700	280 (circ.)	3	No organized efforts to procure re-vaccination.
9. Thewlis & Griffith ...	170	54	1	At expense of firm. No compulsion.
10. Jas. Fairclough & Sons	82	82	0	At expense of firm.
11. Monks, Hall & Co. ...	—	—	10	No enforcement.
12. Messrs. Armitage & Rigby	1400	1047	9	Under compulsion, at expense of firm. Of the other 353 many already done on their own account. Age and chest affections the only excuse.
13. Platt's Fustian Cutting Shops	600	400	31	At expense of firm. Many others done on their own account.
14. Whitecross Co., Limited	600	170	15	This is total number at expense of firm. Others on own account.

I have given the above as a few of the chief instances in which vaccination has, undoubtedly, not only saved workpeople from Small-pox, but prevented the other attendant evils—the destitution and starvation of their families. But one ought in fairness to give the statistics with regard to other works. In the list I give above, the manufactories in the immediate neighbourhood of the Hope Hospital are given first. The first seven are all within 500 yards of it, and so their employés had every chance of becoming infected. It is perhaps needless to reiterate that all cases of Small-pox occurred before the re-vaccination of the hands, or if after, in each instance infection had taken place previously to the operation.

Numerous cases could also be given where private households have escaped through this simple precaution. I will give one which may serve to illustrate, not only how the disease may be prevented, but how its extension may be facilitated. A man living in Chorley Street was taken ill and died of confluent Small-pox after five days, when the epidemic was at its height, and admission to Hospital was impossible. His funeral took place on November 19th, and four persons who attended it, none of them re-vaccinated, were a fortnight from that time admitted with the disease. On the same day (that of his burial) linen from the house of the deceased was taken to be washed to a house in Ellesmere Street, and a fortnight from then two of its inmates were attacked. Now the family living there is interesting, seeing that the mother, while running this risk of washing infected clothes, had at the same time the wisdom to take the precaution of having herself and most of her family vaccinated within three days (two, it will be seen, had been done a few years ago and so did not require it). But the husband and youngest infant, in whose case the prophylactic was not applied, caught Small-pox. The family consisted of the following members:

Father, aged 39		Vaccinated in infancy; unsuccessfully re-vaccinated in 1872.	Attacked by severe Confluent Small-pox, on Dec. 4, but recovered.
Mother	„ 30	Vaccinated in infancy; re-vaccinated, November 22nd, 1892.	Escaped entirely.
Son	„ 8	Vaccinated for the first time, November 22nd, 1892.	
Daughter	„ 7	Vaccinated for the first time, November 22nd, 1892.	
* Daughter	„ 4	Vaccinated in infancy; re-vaccinated, December 3rd, 1892.	
* Daughter	„ 2	Vaccinated in infancy; re-vaccinated, December 3rd, 1892.	
Son	„ 3 months,	Vaccinated for first time, December 3rd, 1892.	Attacked with Small-pox on December 4th, a severe confluent case, resulting in pitting.

* These children, having been so recently primarily vaccinated, did not really require a repetition of the operation.

The above is only one of the many instances in which the value of vaccination has been exemplified, and serves also to support the opinion generally held, that its performance within two or three days of exposure to infection is sufficient to prevent the attack.

The experience we have had of Small-pox among re-vaccinated workpeople is borne out also by what we have seen among certain classes of the population, and among people specially exposed to infection in one way or another.

1. The Troops are stationed at Orford Barracks, situated about one mile west of the Hope Hospital. All recruits, of course, are re-vaccinated on joining the service, but in view of the epidemic every man, woman, and child in the place was inspected for satisfactory marks, and those who did not bear them were at once re-vaccinated. The troops were prohibited from frequenting the infected areas, a regulation which I can hardly imagine was carried out. Arrangements were early made with the Health Department for receiving into the Hospital any cases of Small-pox that might occur in the Barracks. NONE have occurred so far. The average strength of Troops has been as follows :—

REGULARS.				MILITIA.			
Officers.	Men.	Women.	Children.	Officers.	Men.	Women.	Children.
15	294	80	189	1	220	15	30

a total of 824 persons.

2. No case has occurred among 117 re-vaccinated persons in the Postal service.

3. No case has occurred in the Police Force, whose members were all re-vaccinated.

4. The following persons have been exposed to contact with Small-pox in the discharge of their duties at the Aikin Street and Hope Hospitals :—

Medical Officers.	Nurses.	Wardmaids, Laundresses, &c.	Porters and Ambulance Men.	Total.	Had had Smallpox.	Re-vaccinated.	Cases of Smallpox.
2	16	2	3	23	3	23	0

The above enumeration refers only to those persons whose daily work brought them into touch with the patients at either of the

Hospitals. The whole of the Aikin Street staff were re-vaccinated in May; but TWO persons who joined it after that date, a nurse and kitchenmaid, contracted the disease, one having been re-vaccinated after infection, the other being about to be done when taken ill. Neither of these ought to have, and so far as is known did come near the Small-pox patients; the method of their infection remains a mystery. At the Hope Hospital all new nurses have been re-vaccinated on their arrival; several were done successfully, the others had been done before at other hospitals. The subordinate members of the staff have, as a rule, been chosen from among the patients from time to time.

5. Twenty-two persons have been taken into the Hope Hospital not suffering from Small-pox. They were the following:—

INFANTS AT THE BREAST ..	14	Nine vaccinated before admission, none had Small-pox.
		Five vaccinated after admission, two* got Small-pox.
CASES OF CHICKEN-POX	5	Four vaccinated before admission. } None had Small-pox.
		One vaccinated after admission. } None had Small-pox.
CASES OF SCARLATINA.....	2	Vaccinated before admission; did not get Small-pox.
CASE OF ACNE	1	Re-vaccinated a month before admission.
ADULTS, with various diseases wrongly diagnosed as Small-pox.	2	Re-vaccinated on admission — One successfully; the other unsuccessfully. The latter got Small-pox.
	24	

Circumstances Tending to Prevent the Spread of Small-pox in Warrington, or otherwise.

What is known as the dual system of notification, existent in Warrington since 1879, by which the obligation of making known any case of infectious illness is imposed both upon the householder and upon the medical attendant, practically in most cases results in the share of the former being purely nominal. In the case of Small-pox, however, which has greater terrors for the public than many more serious and less avoidable diseases, the mere suspicion of having a case in their houses has been enough in numerous instances to lead people to report the matter at the Town Hall without the intervention of any medical attendant. This was, of course, as it should be—and though it may have occasionally given rise to slight friction, generally the medical attendants were quite as anxious to get such patients off their hands as were the other inmates of the infected house. It has, however, been a matter for grave regret that mild cases unattended with any particular degree

* These two having caught the infection previously to admission.

of illness have been looked upon as less serious as regards infection, whereas in all probability they were quite as dangerous as more severe ones. This idea, that slight attacks were not so likely to spread the disease, does not appear to have been always discouraged by people who should have known better.

In such a disease as Small-pox, which is infectious some time before the rash appears, the desirability of early isolation and the not infrequent difficulty of diagnosis in the initial stages are often things by no mean to be reconciled, and when the disease is a new experience to most of us, a hesitancy in pronouncing for Small-pox is certainly excusable. Possibly a tendency to watch the development of symptoms, which should have been conclusive some days before notification, was not unconnected with the same difficulty. Still I believe many cases might have been prevented by earlier recognition of the disease. Errors in diagnosis were of course inevitable, but they amounted to not more than 1 per cent. of the total cases: such patients were nearly all suffering from chicken-pox, a disease hardly in many cases, in some impossible, to be distinguished from mild Small-pox, except where we can put the subject to the test of vaccination, as in one instance that I have detailed.

The mildest case of Small-pox I have ever seen had an eruption consisting of *three* spots only, which a casual observer might easily have regarded as nothing more than ordinary pimples. The history of the patient was, however, conclusive. His son, an unvaccinated child of 11 years of age, was taken ill with confluent Small-pox; the onset in the son occurred on the same day as the typical back-ache in the father: the development of the severe eruption in the former was simultaneous with the appearance of the three pocks on the father's face. This man had been at large some days, when he came up to the Hospital to inquire about his son, and I was lucky enough to detain him.

The necessary corollaries of notification, disinfection, and isolation are certainly those parts of our sanitary administration most open to criticism; the latter I shall deal with in speaking of hospital accommodation in general. As regards disinfection a few words will suffice. There is no denying that at the height of the epidemic there was some failure to keep pace with the number of houses to be disinfected; at the same time it is difficult to estimate the extent to which the neglect thus occurring helped to spread the epidemic; secondary cases occurred in 79 out of 395 invaded houses, and mostly at such a time after the first as to make it most *probable* that the infection was directly from it. In only about ten instances were the subsequent cases so long after as to make it *possible* they were derived from the poison lingering about in clothes, furniture, etc.

In two instances, that I know, have cases of Small-pox arisen among new tenants of houses that have been empty some months after earlier cases; in each instance the dwellings had been thoroughly cleansed, stripped of paper, and disinfected.

At the same time I wish to call the attention of the Committee to the fact that the securement of efficiency in the Sanitary Department must depend on a complete reorganization on such a scale as to provide suitable men for carrying out all the duties, and properly qualified inspectors to superintend and direct them. They ought to be more directly under the control of the chief executive officer of the Health Committee, the Medical Officer, than the semi-independent staff at present existing.

Again, the system of disinfection, as carried out here and in most towns, appears to be unsatisfactory. However thoroughly the house and bedding be attended to, if the persons of those who looked after the patient are neglected, what has been done is, at the best, partial, for the clothes of those who are in contact with him must necessarily harbour infection, almost as much as the bedding, and certainly a great deal more than the wall-paper. These people have generally to be turned out into the street during the fumigation of their premises, so that one chief result of the whole operation may be to spread infection among the neighbours.

The Infectious Diseases (Prevention) Act of 1890 imposes on local authorities the duty of providing shelters where such persons may stay while the house is being disinfected. Such a structure should provide means for the cleansing, not only of their wearing apparel, but of their bodies—and in some cases new clothes would have to be purchased at the *expense of the ratepayers*.

The Influence of Hospitals.

I have already given an account of the events which led to the starting of the Hope Hospital, and of the difficulty of providing isolation for the cases both before and after that event. I have also referred incidentally to diffusion of Small-pox by cases left in their own homes ; this was of course to be expected, except where we had to deal with people alive to the responsibility resting upon them, and so anxious to save their neighbours any chance of danger. The possibility of aërial conveyance is an accident that can hardly be prevented in private dwellings. In estimating the value of early removal, several difficulties face us.

1. The diagnosis and notification may not be made for some days after the case has been infecting the other inmates.

2. The other inmates may all be re-vaccinated within a day or two of exposure to infection, and so prevented taking the the disease.

3. Incompleteness of disinfection may provide a means of fresh contagion, which cannot be clearly distinguished from the original source.

4. The probability of the spreading of the disease by the presence of a Small-pox Hospital in the neighbourhood may obscure the usefulness of the removal of cases to a cursory glance.

It appears, however, that the result of your action in taking in cases from the Rural Sanitary District affords a striking proof of its wisdom. The small epidemic which was raging at Sankey Bridges, an extra-municipal portion of the township of Warrington, but actually contiguous to the Borough boundary, and distant only about 2,300 yards in a direct line from the Hope Hospital, has now quite subsided. During February and March we admitted 22 cases from this region, and though cases are still cropping up in the Borough, Sankey Bridges appears to be quite free. This gives a most striking proof of the value of taking the patients right away from the infected part.

I have referred to the Hospital as spreading the disease ; of its special incidence upon the neighbourhoods both of Aikin Street and the Hope Hospital, a glance at the maps I give, will suffice to show the fact. The experience of other places has not been unlike ours in this respect ; and though in the case of Aikin Street Hospital there are features which make its influence difficult to appreciate, I do not think there can be any doubt that these places have been centres of infection to the surrounding populations.

To explain this fact, which raises a most serious question, when the provision of isolation for populous districts has to be considered, two theories are brought forward :—

1. That the infection is air-borne.

2. That the disease is spread in the neighbourhood of the Hospital by direct contagion, *e.g.*, (*a*) by communication between patients and people outside the Hospital ; (*b*) by infection carried out by members of the staff, and tradesmen bringing goods, &c.

I have proposed for myself the task of inquiring how far either theory is upheld by our experience in Warrington, though it is a question bristling with difficulties and contradictions of all kinds. I would in the first place observe that, since the possibility of the diffusion of Small-pox by direct contagion is beyond question, these methods of spread are not excluded by the theory of air-borne infection. The proof of the latter must greatly depend upon showing that large numbers of cases are not sufficiently accounted for by a history of contagion, more especially in the immediate vicinity of the Hospital. Air-borne germs carried from such a centre would naturally fall most thickly near to it, but be more scattered at a distance, and consequently we should expect a gradually diminishing frequency of infected houses as we passed outwards from such a point. Similarly, a considerable number of infections traceable to some definite contact would, if chiefly in

close proximity to the Hospital, point to some communication, direct or indirect, between the patients and surrounding inhabitants, if, on the other hand, chiefly on the outskirts of an area of infected houses so accounted for, would add support to the theory of aërial conveyance.

For the purposes of this report, a house is regarded as "newly infected" 13 days (the average incubation period) previously to the appearance of the rash in the first case therein. I have not counted again dwellings in which this disease occurred a second time after some considerable interval, though these might rightly be regarded as re-infected. They are, however, few in number, mostly lodging-houses, and the disease generally introduced from outside the Borough.

The Influence of Aikin Street Hospital.

Up to September 19th, when the Hope Hospital was opened, 86 houses, counting as such the Workhouse and the residential block of buildings at Aikin Street, became infected. During this period 19 cases only could be removed to Hospital of the total number contained in these houses, while most of them were taken away to Dallam Lane, as soon as the ward was ready. Sixteen, however, were never isolated, but remained at home the whole time of their illness, while many others, probably at least 60 in all, were so for a part of it. Still, as subsequently in case of the Hope Hospital, the cases were aggregated in the neighbourhood of the Hospital. There are features about the place which merit a special description.

1. The ward of the Aikin Street Hospital, the Borough Isolation Hospital, in which the Small-pox cases were placed (13 being the largest number at one time) is quite close to the administrative block of buildings, the back door of the latter being only separated by three yards from the entrance to the former. This ward, originally intended for typhoid fever, has been used repeatedly during the last fifteen years for cases of Small-pox, and that without any harm resulting. The other blocks used for scarlatina are in close proximity.

2. One nurse only was employed to look after the Small-pox; she slept in a small room in the same block.

3. The same ambulance man at this period removed both scarlatina and Small-pox—in different vehicles.

4. Aikin Street, at the termination of which the Hospital is placed, forms the only approach to the town, but the streets most severely affected were Wakefield Street, Guardian Street, and

especially Howard Street, indicated on Map I. by a long line of infected houses. They are not thoroughfares, being bounded at the Northern end by the high wall of the Union Workhouse. The people in these streets are very "neighbourly," and continued to visit one another despite protests, after they had Small-pox in their houses. In 20 altogether of the houses infected during this period was a history obtained that gave a reasonably definite contagion with Small-pox cases. Again, in 9 instances the suspected source was the cutting shop in Aikin Street, at which the girls, primarily afflicted as regards their own homes,worked—in 5 of these the development of the rash tallied with infection on or about the same day, at a time when another was at work coming from a house where Small-pox was being nursed. Considering these facts, the number of cases being treated at home, and the extreme probability of there having been cases so mild as to escape observation, there can be no doubt there was unlimited opportunity for the diffusion of the epidemic by contact.

5. I have been able to trace no cases to conveyance of infection out from Aikin Street Hospital, except for the instances I mentioned on page 17.

I have, however, investigated the incidence of Small-pox upon the region extending 1,000 yards from the Small-pox Ward at Aikin Street in every direction and have further extended my inquiries to each zone of 100 yards width within this. I have adopted these distances chiefly for comparison with the Hope Hospital, as regards which my inquiries were first made on a similar principle. This special area, bounded by a circle of 1,000 yards radius with its centre in the Small-pox Ward at Aikin Street, includes a good deal of land not covered by houses on the northern and eastern sides, while on the town side it is occupied to a great extent by manufactories and railway crossings. Consequently the total number of houses is only **2,689**, which at a rough estimate of **5½** persons to a house, gives us a population of **14,789**, as compared with **7,227** houses and **39,748** persons in the rest of the Borough. Within this area **66** houses, or **3·6** per cent., were infected; in the rest of the Borough 20, or **0·2** per cent., so that the relative incidence of Small-pox upon the former was 18 times that upon the latter. Within the area itself we find a gradually diminishing relative incidence as we examine each zone outwards, but with some irregularities, as the table will show. The figures, however, on which these percentages deal are small, perhaps too much so to found any wide generalizations upon. Of the number of infected houses (20 in all), where a history of contagion was obtained, 17 were situated within the special area, 3 outside. I have, however, shown how many opportunities there were for this method of spreading the disease, and on the whole we must admit that little if anything can be stated with any degree of assurance about

aërial conveyance at this period. It does not, however, appear to me unreasonable to believe that the aggregation of so many cases in this region was equally dangerous to the town at large from the risk of air-borne infection, as the few cases we were able to take into Aikin Street Hospital.

Table XIV.

Showing for the period of use of Aikin Street Hospital for Small-pox (July 28th to Sept. 19th, 1892), the number of houses newly invaded in several areas within 1,000 yards of the Hospital, and in rates per cent. of houses, &c.

Total Number of Houses Newly Infected.	Houses newly-infected within 1,000 yards of Aikin Street Hospital.			The same in rates per cent. of Houses.	In Special area of 0—500 and 500—1,000 yards.	In Special area of 0—1,000 yards.	In the rest of the Borough per-centage
	Zone.	No. of Zone.	No. of Cases.				
86	In circle 0—100 yards from Hospital	1	5	10·4			
	In zone 100—200 yards from Hospital	2	15	6·2			
	In zone 200—300 yards from Hospital	3	23	5·7	3·9		
	In zone 300—400 yards from Hospital	4	1	0·4			
	In zone 400—500 yards from Hospital	5	4	1·3		2·4	
	In zone 500—600 yards from Hospital	6	2	0·9			
	In zone 600—700 yards from Hospital	7	6	1·4			
	In zone 700—800 yards from Hospital	8	4	1·4	1·1		
	In zone 800—900 yards from Hospital	9	4	1·4			
	In zone 900—1000 yards from Hospital	10	2	0·6			
	In the rest of the Borough	—	20	—	—	—	0 2

BOROUGH OF WARRINGTON

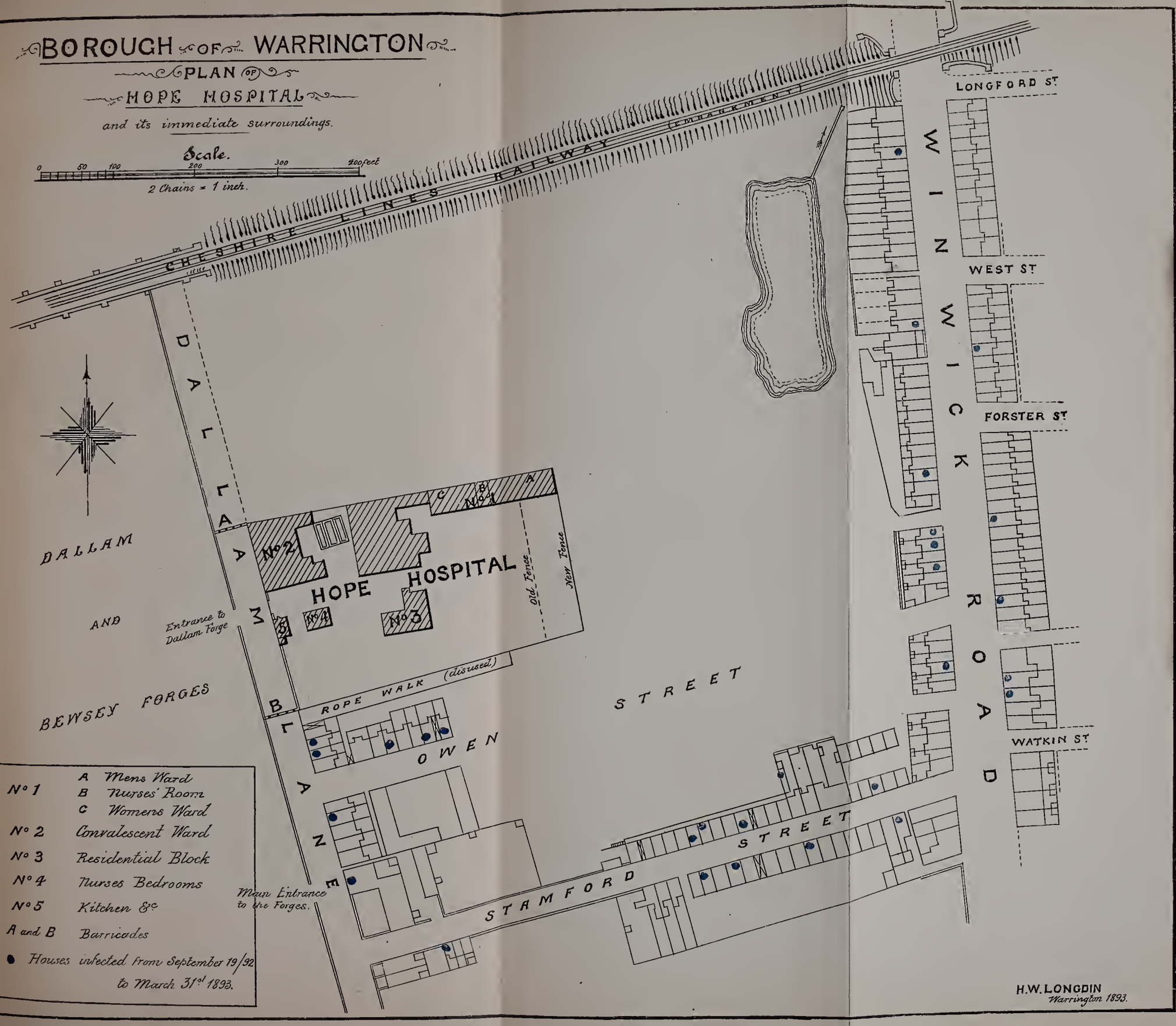
PLAN OF HOPE HOSPITAL

and its immediate surroundings.

Scale.

0 50 100 200 300 400 feet

2 Chains = 1 inch.



No 1	A	Mens Ward
	B	Nurses' Room
	C	Womens Ward
No 2		Convalescent Ward
No 3		Residential Block
No 4		Nurses Bedrooms
No 5		Kitchen &c
A and B		Barricades
●		Houses infected from September 19/92 to March 31st 1893.

H.W. LONGDIN
Warrington 1893.

The Influence of the Hope Hospital.

The Ironworks, disused for years, which were employed as the (Hope) Small-pox Hospital, are situated at the Northern end of Dallam Lane, which divides them from the Forges and Railway Sidings. They are on the edge of a plot of waste land 12 acres in area, bounded to the North by the Cheshire Lines embankment, to the South by Stamford Street, and to the East by Winwick Road —the two latter being thoroughfares bordered by houses.

The Hospital itself, with attached land, occupies 8,700 square yards, and the parts of it which merit mention from the point of view of this report are the following:—

1. The yard, in which the patients can walk about, is bounded on the North by the main buildings of the Works, on the South by an old disused rope walk which lies at the back of a row of houses which form Owen Street, not more than fifty yards distant from the wards; on the West a wall cuts it off from Dallam Lane, and on the opposite side the wooden paling, 10ft. in height, that I have before spoken of, separates it from the waste land.

2. The Acute wards (male and female) contain about 24,000 cubic feet each, and at one time had as many as 55 patients in each of them, and are at the Winwick Road end of the main buildings; they are ventilated by the windows and revolving extractors on the roof, no means being taken for disinfecting the air coming out.

3. The Convalescent wards look out upon Dallam Lane and the Forges: the patients therein were upstairs, and could not come into contact with people outside through the windows, which were covered with wire netting.

4. The sleeping and dwelling rooms for the staff, situated in the middle of the yard, are quite distinct from the rest of the buildings.

The approach to the place is by Dallam Lane, which, since the beginning of November, has been barricaded off both above and below the Hospital; a policeman has since then always been on duty during the daytime in close proximity to the Hospital, to prevent any communication between patients and their friends, and to regulate the traffic, it being necessary to allow a few carts to enter the Forge by the gate shown on the plan.

The circumstances apart from the influence of the Hospital itself which have tended to spread Small-pox in the region around it are: (1) The existence of foci of disease previous to the utilization of the Hospital; (2) The character and habits of the population; (3) Unrecognized cases at large—possibly at work; (4) Cases treated at home; (5) The numerous manufactories, where people are crowded together.

Within the area around the Hope Hospital, with which I am about to deal, previously to September 19th, 39 houses were infected, 4 in the inner half, 35 in the outer half. These, with 5 exceptions, all in the outer half, were all removed to Hospital at some stage of their illness. A reference to the map will show that some of the above cases were so distributed as to form likely starting points for the outbreak, which began in this neighbourhood soon after the place was started. The parts east and west of the place, in which Small-pox has been thickest, form two rather distinct districts. On the east, Winwick Road and its offshoots forms one of the main thoroughfares of the town. On the west the Pierpoint Street neighbourhood, separated from the Hospital by the Bewsey and Dallam Forges, consists of a series of *culs-de-sac*, whose inhabitants are, however, very much given to visiting one another.

During the last fortnight of September, 3 cases only were being treated at home within the special area; they were all in houses situated near its confines, while of the cases notified and therefore becoming infectious during October, 3 only within the same region were not removed to Hospital. It must be remembered that a large number of the infections that took place during the last fortnight of October produced cases of Small-pox that developed during November, that in the latter month our accommodation became inadequate so that 32 cases then notified were left at home (many of them not far from the Hospital), but that, notwithstanding, the total of persons (infected during the latter period) was less than in the former.

I now propose to consider the various ways in which there is a possibility of the conveyance of disease out from the Hospital.

1. Members of the staff during the early period (up to the beginning of November) slept each night at Aikin Street Hospital, going there in a cab specially kept for the purpose. They rarely, if ever, went out into the town. Since that time they have, I believe, conscientiously carried out my directions about change of clothes before going out. I know of only two possible instances of the disease having been dated from contact with members of the staff, but these are exceedingly doubtful. I may, however, say that so far as I know they visited people in the town very rarely, and especially not near the Hospital.

2. Tradesmen have usually come right up to the gates opening into Dallam Lane, and might occasionally, but rarely, have come into contact with patients, when not under observation. Two or three at an early period, before re-vaccination was enforced, contracted Small-pox through so doing. There appears no evidence to show that the disease has been carried by tradesmen

from the Hospital. It is to be remarked that most of the shops are situated a mile away from the place, in the centre of the town, a part comparatively free from Small-pox, and from there goods had to be brought.

3. Up to November the ambulance man of the Aikin Street Hospital continued to remove the cases, the vehicle being kept there. A horse and driver were hired for each occasion from a cab proprietor in the town. Since then the ambulance has been kept at the Hope Hospital, and a nurse only sent out. The horse and man got from the same stables as before, situated more than a mile from the Hospital, have come up for each removal. The man always remains on the box,and does not assist in carrying the patient. One of these men contracted Small-pox during the epidemic: he had been re-vaccinated some years previously. I have insisted on all others being done since.

4. The *patients* before discharge were always thoroughly disinfected, their clothes being sent to the disinfector at Aikin Street, and on being brought back put into the discharging bath-room, in which the final mercurial bath was taken. I have all along inquired for instances of contact with people recently sent out, and do not believe this can have been a means of diffusion of any importance.

5. The most important, however, seems to be how far the patients while in Hospital communicated with their friends, etc. This was always hard to prevent, considering the populous neighbourhood near at hand; generally we confined unruly inmates to bed. Probably the difficulty was at its worst about Christmas, when the incompletely satisfied desire for spirituous liquors of those inside the Hospital rose to an acute point. As a result of this, bottles of various kinds were passed under and thrown over the palings; but I am satisfied that the instances have been few and far between where anything has been thus got out of the Hospital, or where the patients came into direct contact with their friends. It must be remembered that a person receiving the disease from another standing a few yards off, must still get it by *aërial conveyance*. Two cases, however, would appear to have contracted Small-pox by their communicating with patients; possibly others who did so were not ready to acknowledge their foolishness. I must point out, however, that the same conditions have existed up to the present moment.

6. The near friends of patients very seriously ill were on several occasions allowed to visit them. They were re-vaccinated, if they could be persuaded, and had to wear a mackintosh provided. A printed form of directions about this was posted on the Hospital gate.

Table XV.

Showing for the period 20th September, 1892, to 31st March, 1893, the number of patients admitted into, and the daily number of Small-pox cases in the Hope Hospital during successive periods, and the extent during these periods, to which houses in the several areas within 1,000 yards of the Hospital, and houses in the rest of the Borough were newly infected by Small-pox.

Number of Patients Admitted.	Average daily number in Hospital.	PERIOD.	Houses newly infected within 1,000 yards of the Hospital.										In special area 0-1000 yards.	In the rest of the Borough.	The same in rates per cent. of Houses.										In Special area 0-1000 yards.	In Rest of Borough.
			In circle 0—100 yds. from Hospital	In zone 100—200 yds. from Hospital.	In zone 200-300 yds from Hospital.	In zone 300-400 yds. from Hospital.	In zone 400-500 yds. from Hospital.	In zone 500-600 yds. from Hospital.	In zone 600-700 yds. from Hospital.	In zone 700-800 yds. from Hospital	In zone 800-900 yds. from Hospital.	In zone 900-1000 yds. from Hospital.														
			1	2	3	4	5	6	7	8	9	10			1	2	3	4	5	6	7	8	9	10		
		1892.																								
82	50	From September 19 to September 30 ...		—	1	1	5	2	1	—	1	2	14	11	6·2	—	0·4	0·2	1·1	0·2	0·1	—	0·1	0·4	0·3	0·1
128	109	During October	4	6	25	20	16	23	9	11	8	3	125	29	25·	8·8	0·7 10·5	5·3	3·6	3·1	1·7	0·2 1·5	1·5	0·6	3·06	0·49
139	141	During November	1	2	4	7	3	7	3	5	1	2	35	26	6·2	2·9	6·2 1·7	1·8	0·6	0·9	0·5	1·8 0·6	0·1	0·4	0 8	0·4
68	100	During December	—	2	3	1	2	2	1	1	1	1	14	9	—	2 9	1·5 1·2	0·2	0·4	0·2	0·1	0·6 0·1	0·1	0·2	0·3	0·1
		1893.																								
44	63	During January.....	—	1	—	—	—	1	—	1	1	1	5	18	—	1·4	0·7 —	—	—	0·1	—	0·2 0·1	0·1	0 2	0·1	0·3
26	55	During February	—	—	—	1	1	—	1	2	—	1	6	7	—	—	0·08 —	0·2	0·2	—	0·1	0·1 0·2	—	0·2	0·1	0·1
39	50	During March	—	—	—	2	4	4	1	1	2	1	15	22	—	—	0·1 — 0·5	0·5	0·9	0·5	0·1	0·1 0·3	0·3	0·2	0·3	0·3
			6	11	33	32	31	39	16	21	14	11	214	122	37·5	16·1	13·9 10	8·6	7·06	5·3	3·1	2·8 3·4	2.7	2·3	5·2	2·09

In inquiring into the aggregation of Small-pox near to the Hope Hospital, I have based my investigations upon a special area of 1,000 yards radius, making the centre of the circle in the middle of the Hospital grounds, for the following reasons:—

1. It includes all the region of greatest incidence, taking in the whole of the populated districts east and west of the Hospital, which is situated about the centre of the northward extension of the town.

2. It only just touches upon the Aikin Street district where, during the earlier period, there was the greatest prevalence of the disease.

3. The number of houses in it, and in the rest of the borough, are not so widely different, but that they form a basis for fair comparison. At a rough estimate of $5\frac{1}{2}$ persons to a house, the special area, with 4,081 houses, has a population of 22,445, the rest of the borough, with 5,835 houses, a population of 32,092 persons.

I have carried my inquiries so far as to give within this area the incidence, both absolutely, and relatively to the number of houses—in the inner and outer zones of 500 yards each; and also in each zone of 100 yards width from the centre outwards. The results will be best learned by a study of Table XV., of which I shall give a brief summary.

During the whole period dealt with, viz., from 20th September, 1892, up to the end of March, 1893, the number of newly infected houses in the special area was to the number in the rest of the borough* as 17 : 10; whilst relatively to the number of houses, the incidence of Small-pox upon it was twice that upon the remainder of the town. Again, comparing the halves of the special area with one another, and with the rest of the town, we find the relative incidence upon the inner five hundred yards three times that upon the outer, and that upon the outer one-and-a-half times that upon the rest of the town; while the proportions of newly infected houses in the several zones of 100 yards show a progressive diminution from 37·5 to 2·3 per cent.

A study of the figures of the separate returns of the periods for which the whole table is made up is instructive. Up to the end of 1892, the incidence of Small-pox upon the special area both absolutely and relatively was greater than that upon the rest of the Borough; in the latter part of September being three times, in October $7\frac{1}{2}$ times, in November twice, in December three times as great, while the two halves of the area present similar ratios. After the end of 1892, the tables were turned. During the first three months of this year, the infected houses in the rest of Warrington were nearly twice as numerous as those in the special area; in January the relative incidence upon the former was three times that upon the latter; in February and March there was no very great difference in this particular.

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* *The rest of the Borough*, of course, includes the Aikin Street area.

Our inquiries have been specially directed to ascertaining the source of infection in case of every newly-invaded house, as well as learning any common source of origin for the attacks of people working at the same place of business who have been stricken on or about the same day.

From 19th September, 1892, to the end of March, 1893, in 61 newly-invaded houses, out of a total of 336 (or in 18·1 per cent.), has a definite source of infection been traced. These houses were situate as follows, with regard to the special area :—

Zone.		
1	1	
2	2	
3	4	17
4	3	
5	7	
6	6	
7	4	
8	2	18
9	2	
10	4	
In whole of Special area.	35	or 16·3 per cent. of invaded houses.
In rest of Borough.	26	or 21·3 per cent. of invaded houses.

The above figures are small, and besides, in estimating their value the personal equivalent of the inquirer must be considered. In addition to the above cases, in which there was a reasonable element of certainty, there were others of people employed at the same factory becoming infected on the same day. I must say, that in most instances of the kind, no reasonable explanation has been forthcoming.

I have been at the trouble of ascertaining as far as possible the movements of *primarily infected persons* living at a distance from the Hospital, and I find that among the first cases in houses, more than 500 yards from the Hope Hospital,

From Sept. 19 to Sept. 30.—3		
During October ...	... 23	Followed their daily employment within 500 yards of the Hospital.
,, November	... 10	
,, December	... 2	
,, January	... 2	
,, February ...	... 1	
,, Mareh ...	... 2	

These figures, though not conclusive, are suggestive, especially in case of October; during that month of the primary cases a clear majority were within 500 yards of the Hospital at some time or other of the day. The area reaching that distance from the place was replete with chances of contracting Small-pox.

Now, recognizing the fact that the institution of the Hope Hospital was speedily followed by a severe outbreak of Small-pox close to it, and knowing of similar experiences in other towns in connection with wards set apart for this disease, it has been only natural to regard these as cause and effect, an assumption quite justifiable, when we consider that there are no peculiarities either of density of population or sanitary conditions, which might be thought to make the district more vulnerable. This portion of the town is not the most densely populated, and there are numbers of factories, employing many hands, in other parts of it, which necessitate a daily congregation of people, not a whit different from what occurs near the Hospital; unrecognized cases of Small-pox have been at large, and sufferers have been treated at home far away from the place quite as frequently as near to. On the other hand, I have already shown that the non-removal of sufferers can certainly not account for the number of persons who contracted the disease in the *special area* particularly in October.

I have already considered the openings for conveyance of infection by various channels from the Hospital, and shown reason to believe that they furnish no sufficient means of accounting for the facts under consideration. Moreover, the distribution of cases whose source of contamination was directly traceable does not appear to throw any light upon the question. But on the other hand the statistics as to the relative incidence upon the specially afflicted area and its several parts most clearly agree with what we should expect with *air-borne infection* as the explanation of our difficulties. The meteorological history of the time consequently becomes of importance, and more particularly the daily records of the wind.

The Influence of the Weather.

I do not propose to go fully into the meteorology of the nine months from 1st July, 1892, to 31st March, 1893, but seeing that season has, according to previous observations, a well marked connection with Small-pox, it may be of interest and importance to state our own experience. The exact influence of weather ought, it would appear, to be best seen apart from all conditions of isolation, &c.; previous observations have always tended to show that spring was the period of greatest prevalence, as a reference to the history of an epidemic in 1773, which I have included in this report, will illustrate. Our own epidemic produced its greatest number of cases and its maximum mortality in November

—during which month it ought, following the general rule, to have been at its lowest; this severity of the disease corresponded with a large distribution of infection over a specially affected district (chiefly during the last two weeks of October).

In March and April, however, we have had another rise in the number of cases, under conditions probably more strictly natural, because the infected houses were mostly outside the district, that had before suffered most, and outside the range of the Hospital influence. Here we have most likely had an unmodified seasonal influence during a period of remarkably warm and dry weather. May again has shown a distinct decrease in the number of cases.

Now, the direction of the wind is by far the most important feature in the weather reports in connection with the theory, which I believe I have shown reason to think has been upheld in Warrington. We have to deal with the Aikin Street and the Hope Hospital periods separately.

Period I.—The winds most favourable to the conveyance of infection towards populated districts from Aikin Street and its neighbourhood might be from any point of the compass except E., S., and S.E., while from S.W. it would be most likely to endanger the region around what became subsequently the Hope Hospital. Though I have not been able from the investigations about this period to bring forward anything very conclusive, I give the details of the daily readings of the wind vane. It may be that the prevalence of South-easterly winds for a considerable portion of the period prevented a more rapid diffusion of the disease than might otherwise have taken place.

Table showing the number of days on which each wind prevailed during Period I.

	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
July	1	8	2	9	—	8	—	3
August	—	5	—	14	1	8	—	3
Sept. (1 to 19)..	—	1	1	2	—	10	1	4
Totals ...	1	14	3	25	1	26	1	10

Period II.—From the Hope Hospital winds from S.E. would carry particles towards the open country, and from S. or S.W. towards few scattered houses that lie on the outskirts of the town, and these would be the least favourable directions for the distribution of infection. With the wind from any other quarter a populated district might be reached by air-borne infection. I have to note that during October (and this remark applies more particularly to the latter half of the month) there was a considerable prevalence of north-easterly breezes which would strike right across Dallam and Bewsey Forges, in which during this period so many

persons became infected. From that time, however, the most general direction has been from S.E. and S.W., and this probably has saved us many cases.

TABLE showing the number of days on which each wind was prevalent from 20th September, 1892, to 31st March, 1893.

	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
Sept (20-30)	—	1	1	3	—	7	—	1
October	8	9	1	—	—	10	—	3
November	—	1	—	12	1	16	—	—
December	—	10	—	10	—	6	1	4
January	2	3	2	10	—	8	—	6
February*	1	3	—	4	—	11	1	7
March	—	3	2	10	—	10	—	6
Totals	11	30	6	49	1	68	2	27

On the whole, I think that there is a very strong case in favour of air-borne infection having been the cause of the excessive incidence of Small-pox upon the *special area*, beyond whose limits, however, the degree of influence exerted by the Hospital in this way would appear very uncertain. I have, however, shown that this area could only be said to be especially afflicted up to the end of 1892. October was the month in which it was most so; in November and December there was a gradual fall in the disproportion between the two regions under comparison as regards the number of invaded houses. Now there have probably been two factors at work to produce this striking change. We have had to deal with a crowded Hospital in a fairly populous neighbourhood, upon which a continual stream of infectious particles has been flowing, varying according to the direction of the wind in the special part they have lighted upon from time to time. As a result,

(1.) The most susceptible have been weeded out.

(2.) The large number of cases and other circumstances have led to more vaccination and re-vaccination in this area than in the rest of the town. Most of the 2,000 Dallam and Bewsey workmen, besides the numbers of other employés of neighbouring works, who were re-vaccinated, live within this area; there was, besides, every inducement from fear to cause people to seek immunity.

And now we have a Hospital surrounded by an area comparatively immune, because more persons have been weeded out, and more have been re-vaccinated within it than in the rest of the town; it is, in fact, surrounded by a *cordon* of vaccination separating it from a region which, with the exception of the parts

* One day not recorded.

about Aikin Street, contains a greater proportion of suseeptible individuals, but, fortunately, not being so exposed to infection, has not suffered and is not likely to suffer so severely.

As I have based a good many of my investigations with regard to vaccination on the results in Dallam and Bewsey Forges, I propose to devote a special section to its relation to infection, considering how near to the souree of the poison they are situated.

Small-pox in Dallam and Bewsey Forges.

The average period of incubation in Small-pox is 13 days, that is, from the reception of the infection to the appearance of the rash. Consequently in any investigation of the processes, by which the disease is extended, it is necessary to learn the circumstances and chances of exposure of those attacked at a period previous by that number of days to the eruption. I shall thus, in speaking of its spread in Dallam Forge, have to deal with the time of infection rather than of the notifications of individual cases.

First, however, a few words as to the position of these works. They occupy a triangular area which is bounded by the railway on the west, and Dallam-lane on the east, and whose apex points directly north; this area includes also the wire mill of William Smith & Co. and the Bewsey Wire Ropery. The Hospital is situated to the east of the northern extremity, and a circle of a radius of 500 yards with its centre in the Hospital about touches the basal end. Formed by the amalgamation of two originally separate manufactories, they are still distinguished as Bewsey and Dallam Forges; the latter extends to a distance of 300 yards from the above point. One principal entrance is in Dallam Lane opposite the end of Stamford street, but there is also another one over against the Hospital Gate, which was used freely for the ingress and egress of workmen up till the time of the erection of the barricade, which was first completed about the end of October. It has been since and still is used for lurries going in and out, but not for a general entrance.

Five cases only occurred among workers at this place before September 19th, after that date they began to experience the disease with gradually increasing severity, and

From Sept. 19th, to Sept. 30th,		4	Dallam men	were infected.
During October		52	„	„
„ November		9	„	„
„ December		2	„	„
	Total ...	67		

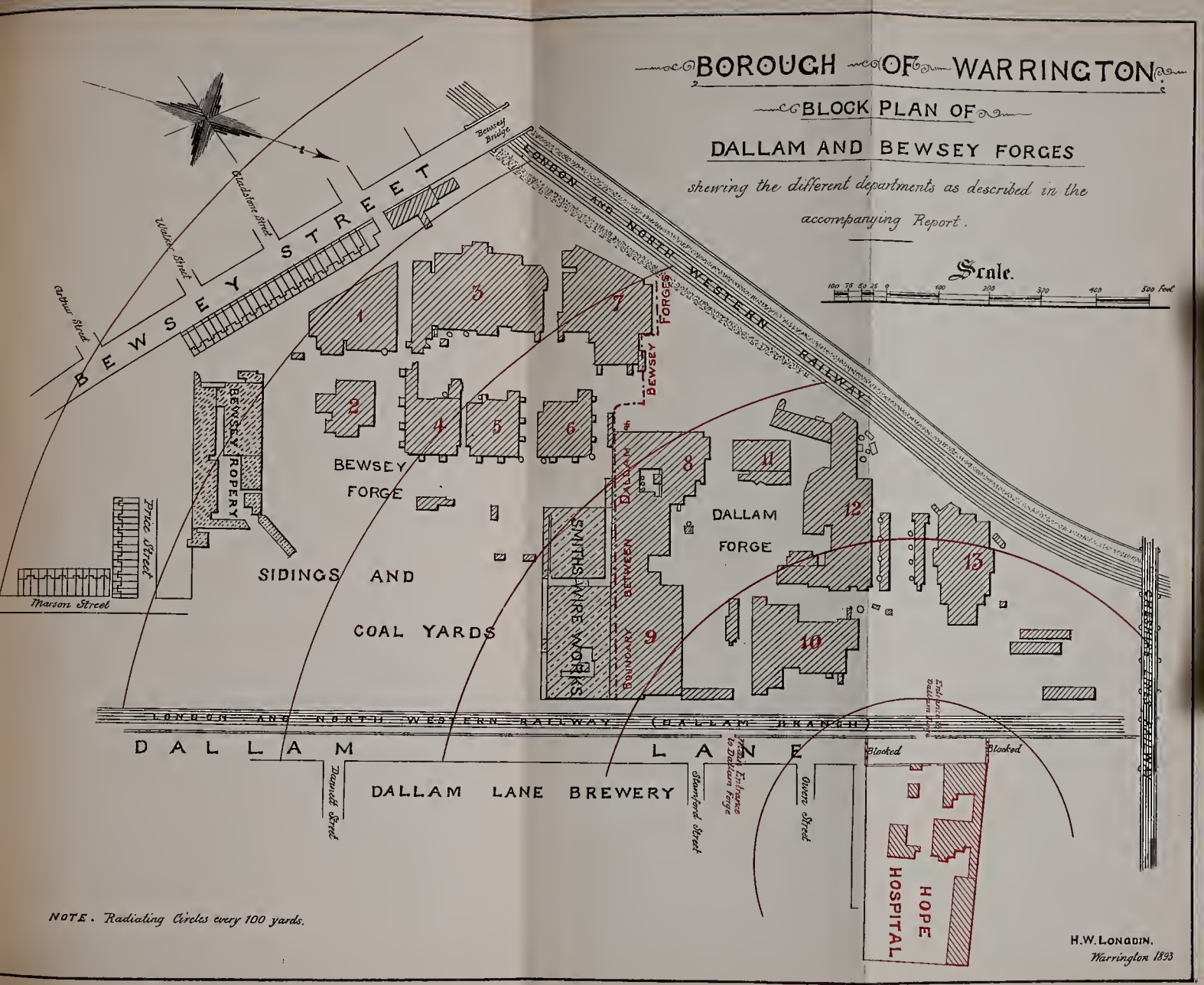
As we have already shown, the general re-vaccination of the hands in November put nearly all of them in a position of security,

BOROUGH OF WARRINGTON.

BLOCK PLAN OF

DALLAM AND BEWSEY FORGES

shewing the different departments as described in the accompanying Report.



NOTE. Radiating Circles every 100 yards.

H.W. LONGDIN.
Warrington 1893

and the few cases that have since occurred among them have been confined to those not so protected. October, being the period of gratest prevalence, is the time about which our chief inquiry must be.

Now it was early noticed that the greater number of cases of Small-pox occurred among the workmen belonging to the Dallam side of the forge, that is that nearer the Hospital, and by a popular application of a scientific theory this was put down to air-borne infection. To establish as a fact such an idea, it is necessary to exclude all possible chances of direct contact with infected persons, and it is to this end that most of my inquiries have been directed. I shall give briefly the results of these investigations.

(1.) Of the four cases in September all were primary as as regards their dwelling-houses.

Of 52 cases in October, 2 only were secondary to previous cases in their dwellings.

Of 9 in November 3 were due to previous cases at home.

Of 2 in December, both were primary.

(2.) No man is known to have been at work with the Small-pox eruption on him, nor are any to be heard of who continued coming while cases were in their homes, at the time when most contracted the disease, though it is possible there may have been unrecognized cases, and that men after the onset may have gone on working till compelled to desist. I cannot hear of any, except one in August.

(3.) As regards the Hospital, I have already suggested the possibilities of contagion existing right through October in the close proximity to its gate of one workmen's entrance. As far, however, as I can ascertain, any communication which did occur between the Dallam men and the convalescent patients, who were upstairs in the building nearest the forge, was by shouting across the lane, and did not involve any direct contact. We were under considerable difficulties in trying to prevent any such risk of spreading the disease, but every avenue was blocked up as soon as possible ; windows were barred and covered with wire netting. On the Winwick Road side these dangers have always existed, but among the Dallam men no case can directly be attributed to coming to the palings.

(4.) Fourteen out of 52 infected in October lived outside the area of 500 yards from the Hospital, which includes the forge. The rest were consequently equally exposed in their own dwellings to air-borne infection.

Now I find that during October, if we fix the dates of infection

as thirteen days previous to the rash (and this is generally correct), there were twelve days on which no Dallam workman caught Small-pox. They were the 7th, 11th to 15th, and 18th to 23rd, inclusive.

The greatest number of infections took place during the last week, as follows:—

Date.	No. of Men Infected.
24th October	5
25th ,, ...	5
26th ,, ...	5
27th ,, ...	13
28th ,, ...	4
29th ,, ...	2
30th ,, ...	3
31st ,, ...	2

and on the other previous days one or two only per diem.

The fact of such a large number of men as 13 receiving the disease on or about the same day naturally raises the question of a common source of origin—either an unrecognized case, or one whose clothes were infected. As I have said, there does not seem to have been such a one.

I have been enabled, through the kindness of Mr. Morris, to ascertain the various degrees to which different parts of the forge were affected. The records they have there apply only to the last quarter of 1892, and are derived from the accounts of the sick club, on which the sufferers from Small-pox were thrown. Consequently some casual and irregular workmen, as well as apprentices, will have been omitted. They give a total of 57 cases (almost entirely adults) for the last quarter, out of an average number of 1,717 employed. The two great divisions, Bewsey and Dallam, engage of this number 753 and 964 respectively; at Bewsey there were 11 cases, a percentage of **1·4**; at Dallam 42, or **4·3** per cent. The figures I give with regard to Smith's and the Bewsey Wire Ropery are for the same period.

It is, unfortunately, impossible accurately to map out the forges in zones of 100, 200, etc. yards from the Hospital, but roughly, as the reference map will show, they may be treated as shown in Table XVI., which includes in its enumeration, the other two works, that lie in the same area.

Table XVI.

SHOWING THE DISTRIBUTION OF SMALL-POX ATTACKS IN DIFFERENT PARTS OF DALLAM AND BEWSEY FORGES DURING THE LAST QUARTER OF 1892.

No. of Department as on Plan.	Average No. of hands.		No. of cases of Small pox		Percentage of hands attacked.
	Men.	Boys.			
1	43	9	3	Corresponding to 400—500 yards from Hospital.	1·5
2	102	7	2		
3	204	70	2		
Bewsey Wire Ropery.	40	40	1		
Totals.	389	126	8		
4	84	2	—	,, 300—400 ,,	0·8
5	84	2	1		
6	85	3	1		
7	151	59	2		
Totals.	404	66	4		
8	259	70	5	,, 200—300 ,,	3·5
9	139	39	2		
11	127	22	8		
12	300	49	19		
Smith's Wire Works.	60	60	5		
Totals.	885	220	39		
10	76	6	5	,, 100—200 ,,	7·2
13	63	21	7		
Totals.	139	27	12		

There can, from the above figures, be no doubt that proximity of a workman to the Hospital has meant increased chance of his being attacked, and since we cannot find sufficient evidence of direct personal contact to account for any considerable pro-

portion of these cases, it remains to be seen whether the wind at this period was favourable to the carrying of particles from the Hospital in the direction of the Forge. From the relative situation of the two places, a North-easterly wind would be most favourable. Our meteorological records for Warrington show its direction was N.W. or S.W. on the fist 11 days of October, and during the latter 20, was N. on 8 days, N.E. on 9, E. on 1, and S.W. on the other 2, and especially was N.E. on the 27th, the day on which our calculations suppose 13 infections to have taken place in the Forges. It is true that the same was the case on several days when no workmen caught the disease; *but*, on the one hand these records are taken daily at 9 a.m., and the wind may have altered at later hours; and on the other the period of incubation may vary within certain small limits. On the whole, however, I think the evidence points strongly towards *aërial conveyance* as the method by which a large number of the men we have had under consideration received the infection of Small-pox.

Quarantine.

The only measures comparable to quarantine that have been adopted in Warrington date from October, after the epidemic had gained a hold on the town; since then, when a case of Small-pox has been reported, a post card has been sent to the employer of every person in the invaded house, and in case of children to the school they attend, notifying the fact. It has generally been left to the discretion of the people thus informed, to decide what course they should pursue. Manufacturers have generally consulted their own Medical Attendant as to when their workers should return to their employment, but when a certificate has been required from the Medical Officer of Health it has been granted on condition of re-vaccination, and after a consideration of the circumstanees of the ease.

Sanitary Conditions.

I do not propose to do more than touch upon this subject, for I am afraid, that to deal with it thoroughly would indefinitely extend this report, which has already attained an abnormal length. There is a great deal of bad property in the town, dating from the period when the place was remarkable for the large population stowed away in a very small area, and was notoriously unhealthy. The improvement of other eonditions, the doing away with open drains and middens, and the introduction of a system of the disposal of refuse—the pail system, which, if by no means perfect, is decidedly better than the old one—have all tended to amelioration of the public health; but these insanitary areas, particularly one condemned speeifically by the Medieal Officer of Health as unfit for human habitation, continue to be a disgraee and a danger to the town. Now it is a fact that Small-pox has shown no special prevalence in these parts.

As regards the pail system, the only important ways in which it could have helped to spread the epidemic seem to be these:—

(1) Through neighbours using the same closet which received the excreta of a Small-pox patient nursed at home.

If this were of frequent occurrence, the men employed in removing these pails would be still more likely to contract Small-pox; in none out of 21 men employed in this work has this happened, and as late as December only two had been re-vaccinated.

(2) Through the returning of pails from Small-pox houses to houses not previously infected.

The thorough cleansing and disinfection they receive at the Intercepting Depôts makes this appear improbable.

Consequently, I believe the pail system has had little or nothing to do with the epidemic.

The Influence of Vagrants and Lodging-houses.

The epidemic, as we know, was originally introduced by a tramp, and since then on 12 separate occasions persons of this class have come into the town in the incubation period, or with the eruption upon them. Of these people one was housed in the Workhouse, six in lodging-houses, while five walked in right to the Hospital. Three of those in lodging-houses gave rise to secondary cases, but of the diffusion of the disease by the others, probable as it appears, we have no definite information.

Besides the above, Small-pox has appeared in eight common lodging-houses, introduced otherwise than by vagrants. In one of them there occurred nine cases, of which seven were due to the concealment of a patient with the confluent variety (a son of the lodging-house keeper); in another two cases developed, and in six others one each. The Sanitary Inspector has been instructed all through the epidemic to maintain a careful oversight of these places; and on several occasions, I have myself paid midnight visits and discovered people with the disease. In the case of the concealment above mentioned, a prosecution and infliction of a fine resulted.

Probably Small-pox has been carried elsewhere on many occasions by vagrants leaving this district, but we have no details. St. Helens, Chester, Liverpool, and Aberystwith are among localities said to have been infected in this manner.

The Cost of the Epidemic.

The actual cost can hardly be estimated directly, seeing that the excess of the Hospitals Account over the estimated expenditure

for the year ending the 25th of March, 1893, includes many items really necessary, but only incurred at the time in consequence of the Small-pox.

The estimated expenditure for Aikin Street Hospital, *i.e.*, for the provision of isolation for infectious diseases, disinfection, salaries of officials, etc., was £1,097 12s.; the actual disbursement has been up to 25th March £9,021 19s. 5d., an excess of £7,924 7s. 5d., of which sum £4,477 4s. 4d. has been spent on the Hope Hospital; the remainder being accounted for by the large number of Scarlatina patients, the building of the new iron hospital at Aikin Street, the provision of the new disinfector, and various alterations. Many of these things, especially the disinfector, were quite necessary before, and their purchase was only hastened by the occurrence of the epidemic.

The loss to the town cannot, however, be accurately measured by these figures; a just estimate would include an account of the loss to tradespeople of all kinds, of the destitution of the families of the stricken, and the untold misery into which many have been thrown. I have no figures to show the amount of out-door relief which was necessitated by the condition of the poor, but many of the families of patients have had to go to the Workhouse to await the return of parents from the hospital.

Table XVII.

Showing the increase in the Expenditure of the Health Committee, during the year ending 25th March, 1893.

HOPE HOSPITAL.

		£ s. d.	£ s. d.
Salaries of Nurses and Medical Officer		506 14 6	
Porter's Wages		31 13 6	
Disinfecting		58 16 10	
Public Vaccination. Medical Men ..	£60 18 0		
Lymph	26 2 0		
Hire of Stations	3 10 0		
		90 10 0	
Medicines, Instruments and Disinfectants		127 2 0	
Stimulants		17 19 0	
Buildings (and erecting and fitting, Joiners and Labourers)		952 2 1	
Rents, &c.		175 13 0	
Provisions		1116 9 10	
Furnishing and fittings (including bedding and clothing) ..		1102 17 6	
Establishment expenses other than above, including horse hire, coffins, travelling expenses		227 1 7	
Compensation to sundry persons for damage to clothing, &c.		20 2 0	
Fees for reporting Small-pox Cases		50 2 6	
Carried forward ..			4477 4 4

TABLE XVII. (*continued*).

	£ s. d.	£ s. d.
Brought forward		4477 4 4
AIKIN STREET HOSPITAL.		
Salaries of Nurses and Medical Officer	499 11 3	
Porter's Wages	67 12 0	
Disinfecting	69 0 3	
Fees for reporting cases (Scarlet Fever, &c.)	57 2 6	
Medicines, Instruments and Disinfectants	146 11 2	
Stimulants	12 7 11	
Rents, &c.	337 11 11	
Provisions	758 18 8	
New Disinfector (fixing, &c.)	361 8 4	
Cost of Land for New Hospital (Conveyancing, &c.) ..	821 13 9	
New Iron Hospital	524 14 0	
Furnishing, Fitting, and other establishment expenses ..	888 3 4	
		4544 15 1
		9021 19 5
Atkin Street Hospital Account (estimated)		1097 12 0
Excess of actual over estimated expenditure		£7,924 7 5

CONCLUSION.

The lessons to be learnt from the events of the last year in Warrington are but repetitions of the experience of other places; but since the community is slow to use them to its advantage, their restatement is amply justified.

We have two chief things to rely on for controlling Small-pox—*isolation* of the sick and *vaccination*.

A perfect system of isolation for this disease requires—

(1) A householder always conscientious, zealous about the public health, prepared to summon a medical man at the earliest moment.

(2) A medical man able to make the diagnosis at the first onset of the disease in all cases (which is absolutely impossible), and prompt to notify.

(3) An hospital which spreads the disease defeats its own object, and so we ought to have one specially kept for the purpose so far removed from inhabited districts, or so constructed as to prevent all possibility of aërial conveyance, and so organized as to minimise to the lowest degree the risks of any method of diffusion.

(4) An elaborate system of disinfection and quarantine; disinfection of all things in the house and all its inmates, as well as quarantine for a stated time of all persons exposed to infection.

All this means great expense and numerous officials, and the

precautions thus adopted would be liable to be easily defeated; a defect in one part of the machinery might throw the whole of it out of gear.

It requires as a necessary adjunct *vaccination*, of which the value has received irresistible support during our epidemic.

It would appear that—

(1) While *primary vaccination* in infancy lessens greatly a person's liability to contract Small-pox, and enormously his chances of dying from it, and while also vaccination implies a diminished liability to *severe Small-pox* in direct proportion to its thoroughness, efficient vaccination gives no absolute guarantee against *severe Small-pox* during the second decennium of life.

(2) That so, not only *efficient vaccination*, but *compulsory efficient re-vaccination* is desirable before adult life is reached.

(3) That since no cases of Small-pox have occurred in persons re-vaccinated within a day or two of exposure to infection, a measure for *compulsory re-vaccination* of all persons in a house where Small-pox has occurred ought to be enacted.

(4) That *public vaccination* ought to be under the control of the authority of each Sanitary District. This transference of administration from the Guardians of the Poor to the Sanitary Authority would remove the last reminiscence of pauperism from this important matter of sanitation; would prevent delays; obviate misunderstanding, and throw the responsibility on the right shoulders.

(5) That some means should be adopted for securing the efficiency of vaccination by private practitioners, and some system of periodic school inspection instituted by law.

Were vaccination and re-vaccination thus carried out, isolation hospitals and their accessories might not only be on a very small scale, but cost little or nothing to the community, while quarantine would only be necessary for persons re-vaccinated some days after exposure to infection, but Small-pox would become so very rare, that such means would have to be resorted to only very occasionally.

In addition, however, some better means of controlling the spread of Small-pox by vagrants is desirable.

(1) By compulsory re-vaccination, and

(2) Detention in quarantine within infected areas of such persons known to have been exposed to infection.

ADDENDUM.

John M., æt. 9, 54, Pierpoint-street, who died on April 21 from Confluent Small-pox, was examined at school in December last, and found to have no vaccination marks. The usual notice was served on the parents, but they produced a copy of the certificate of successful vaccination given them by a medical practitioner in Cumberland, so no further steps were taken. When the child was admitted I again examined its arm, and satisfied myself that there was no evidence of successful vaccination.

Two deaths have also occurred, not included in the report, in connection with which Small-pox has been mentioned as a cause.

John G., æt. 26, 88, Pierpoint-street, admitted on October 21 with a very mild attack of Small-pox; was, while in Hospital, attacked with acute Bright's disease, of which he ultimately died at home on February 5th; he had two satisfactory vaccination marks. I think it doubtful whether the fatal illness had any connection with the Small-pox.

Dennis C., æt. 12, 3, Crossley-street, died before a doctor was called in, after being ill some days. He had one large vaccination mark. The circumstances and history of the case were by no means conclusive, and the medical man, who was called in after death, had grave doubts about it. In the death returns it appeared as due to *malignant small-pox*, and this was said to be BY ORDER OF THE CORONER. This is a case which might well come under the consideration of the Committee of the House of Commons on Death Certification.

Note on the Included Maps.

The maps and plans, for the preparation of which I am greatly indebted to Mr. Herbert Longdin, will be found to present a fairly accurate idea of the distribution of invaded houses. A few trifling mistakes have crept in in the position of the dots in their respective zones; these need not, however, impair the value of the maps as illustrating the text of the report, into which I have endeavoured, by great care, to introduce the greatest possible degree of accuracy.

This Report deals with the epidemic up to the 31st March, 1893.

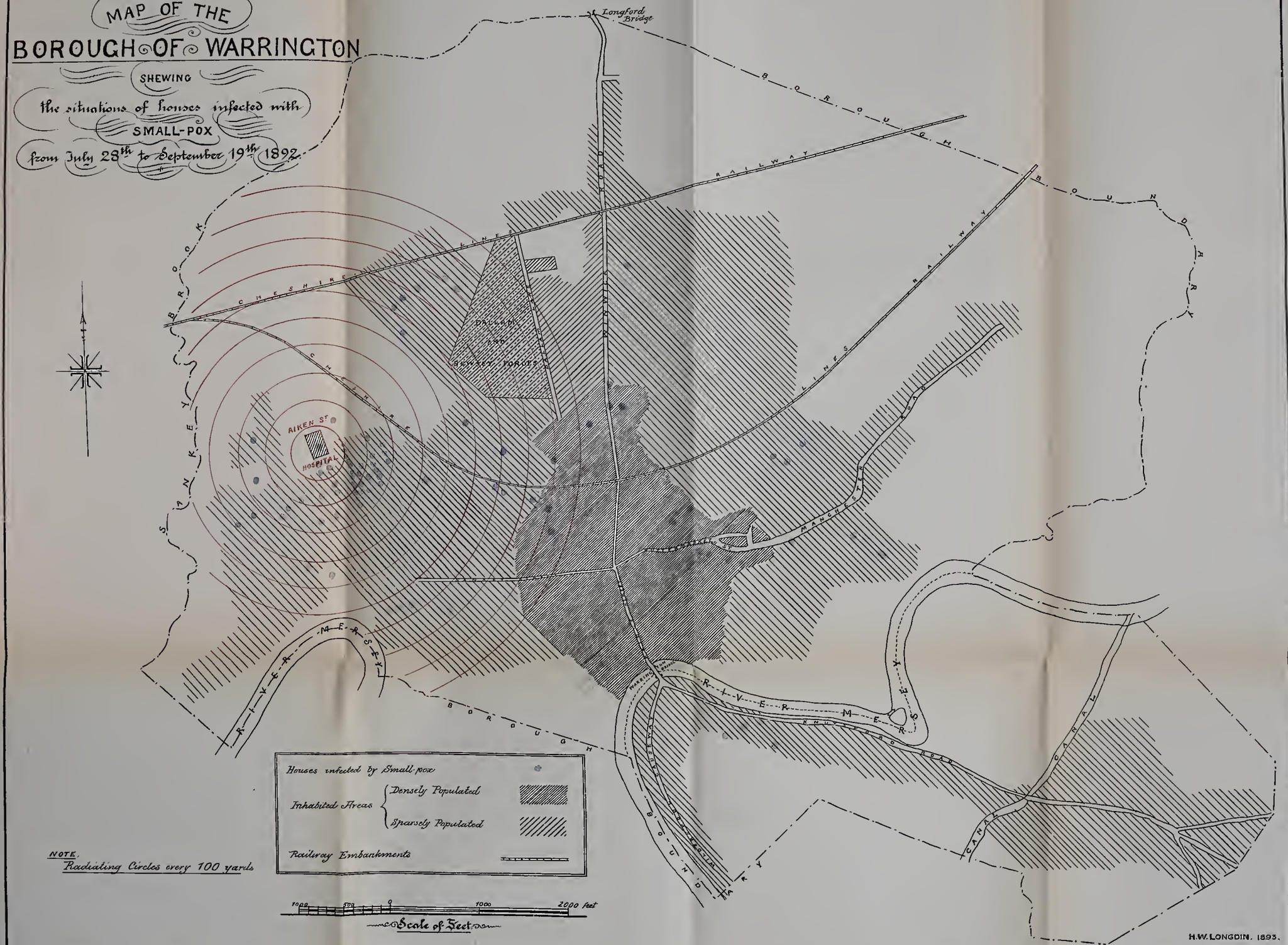
MAP OF THE BOROUGH OF WARRINGTON

SHEWING

the situations of houses infected with

SMALL-POX

from July 28th to September 19th 1892.



NOTE.
Radiating Circles every 100 yards

H.W. LONGDIN. 1893.

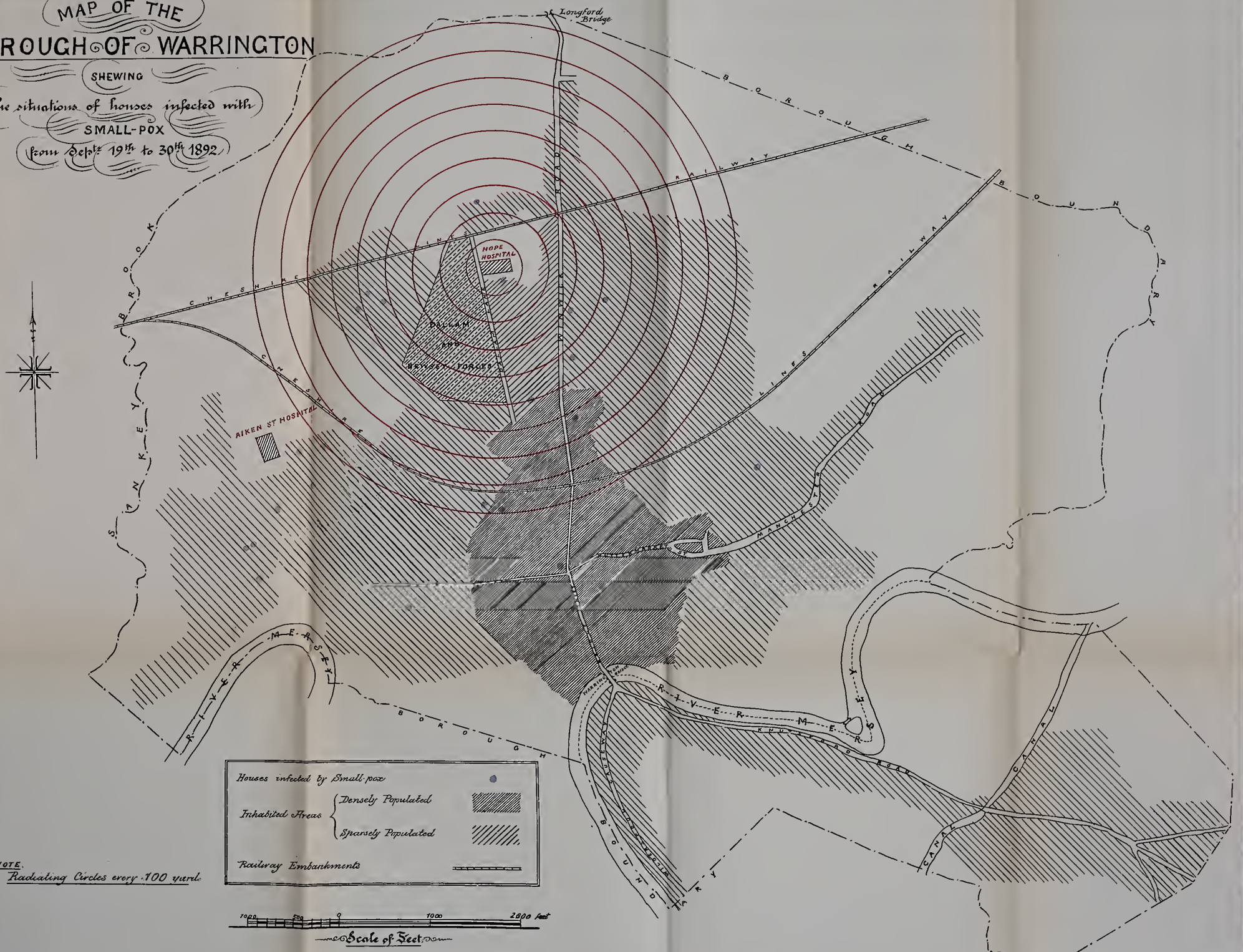
MAP OF THE BOROUGH OF WARRINGTON

SHEWING

the situations of houses infected with

SMALL-POX

from Sept^r 19^th to 30^th 1892



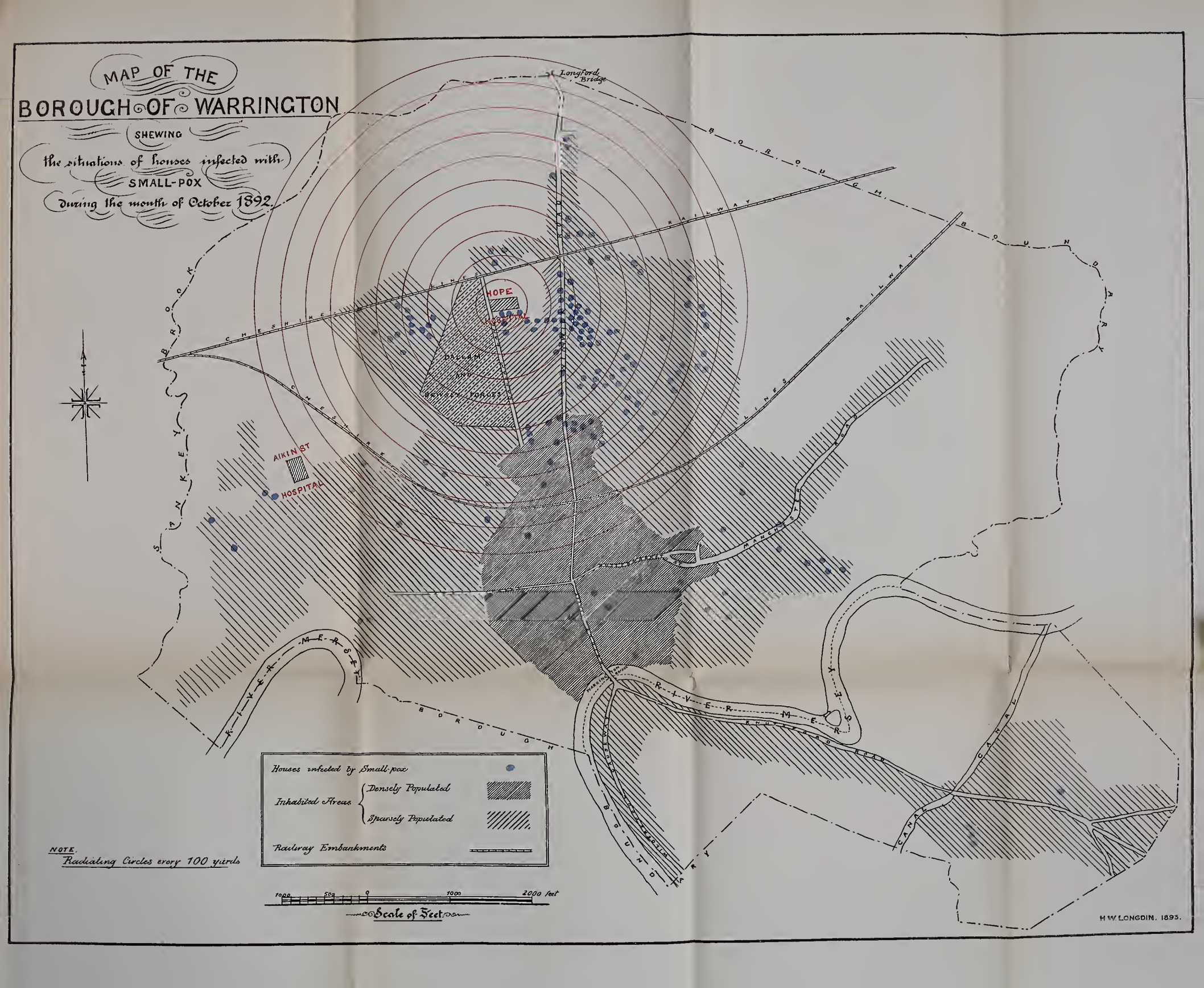
NOTE.
Radiating Circles every 100 yards

MAP OF THE BOROUGH OF WARRINGTON

SHEWING

the situations of houses infected with SMALL-POX

during the month of October 1892.



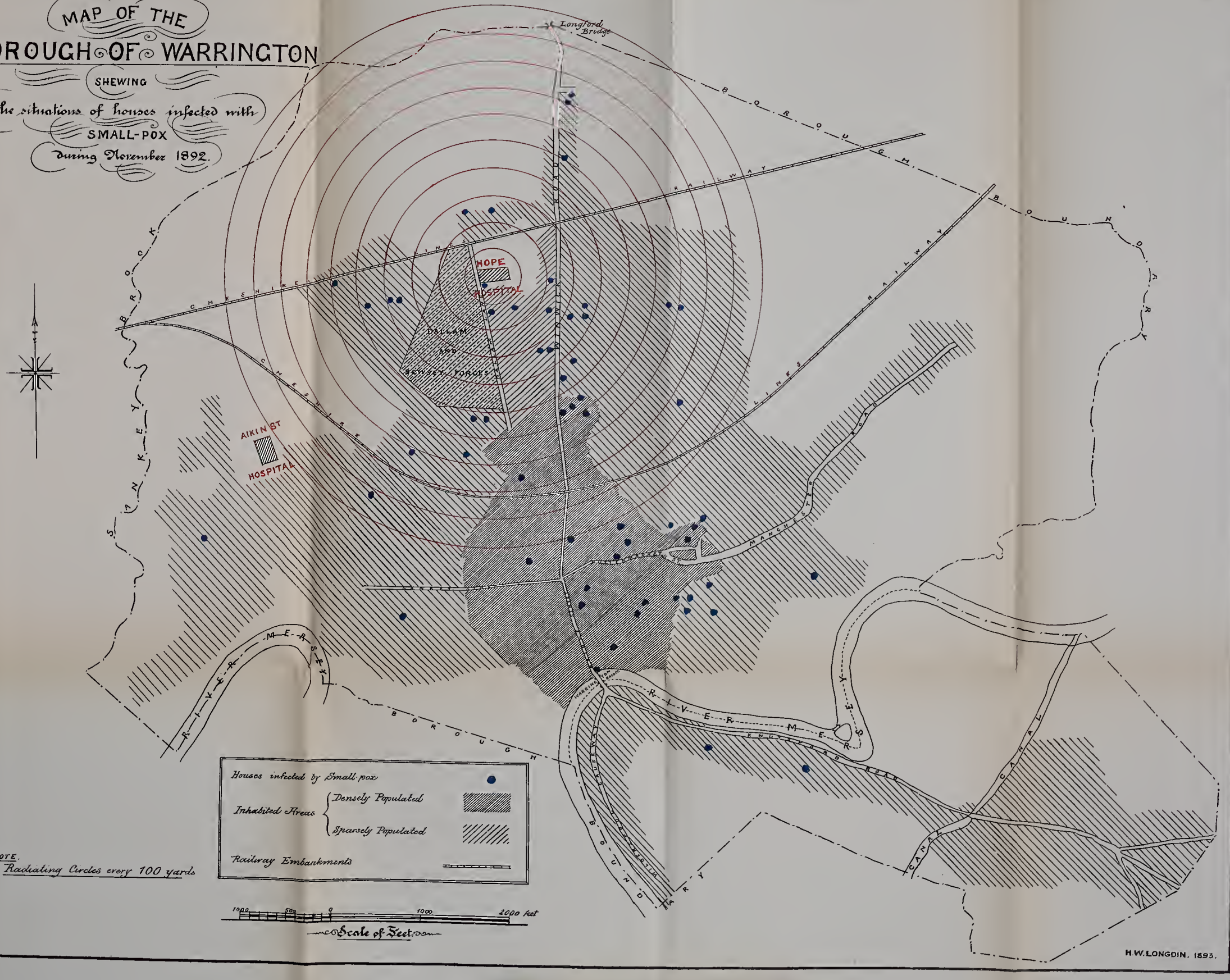
NOTE.
Radiating Circles every 100 yards

H.W. LONGDIN. 1893.

MAP OF THE BOROUGH OF WARRINGTON

SHEWING

the situations of houses infected with SMALL-POX during November 1892.



NOTE.
Radiating Circles every 100 yards

H.W.LONGDIN. 1893.

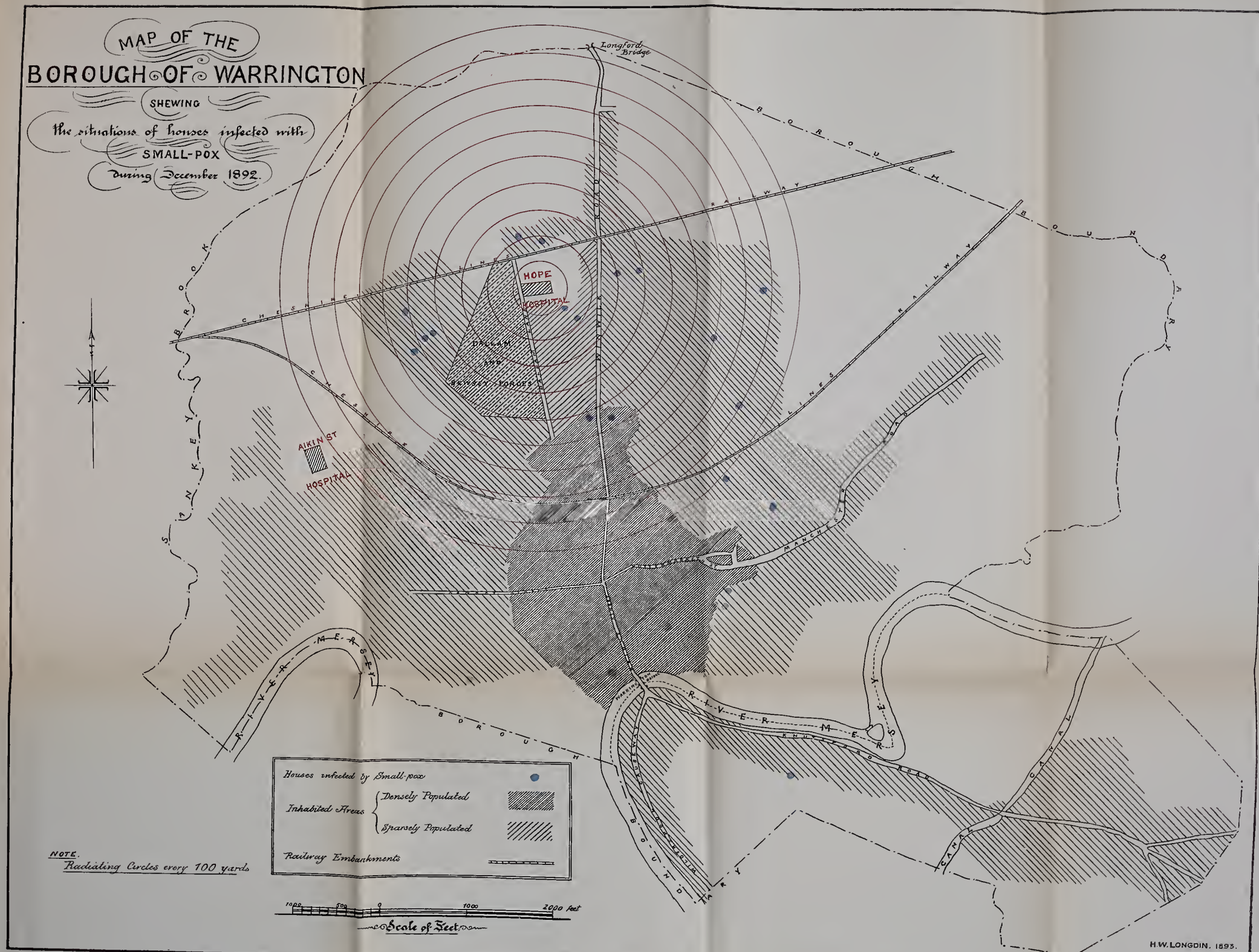
MAP OF THE BOROUGH OF WARRINGTON

SHEWING

the situations of houses infected with

SMALL-POX

during December 1892.



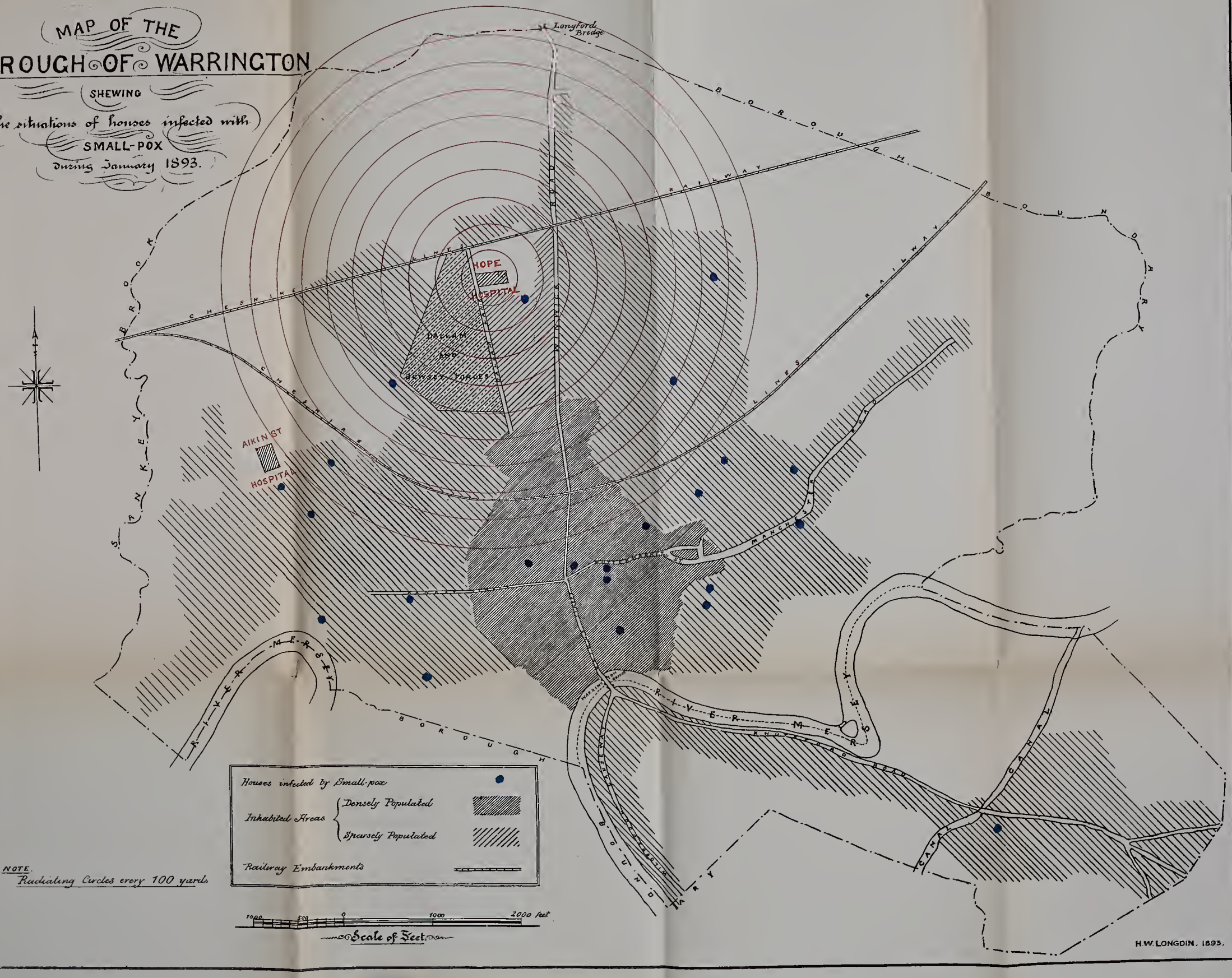
NOTE.
Radiating Circles every 100 yards

H.W. LONGDIN. 1893.

MAP OF THE BOROUGH OF WARRINGTON

SHEWING

the situations of houses infected with SMALL-POX during January 1893.

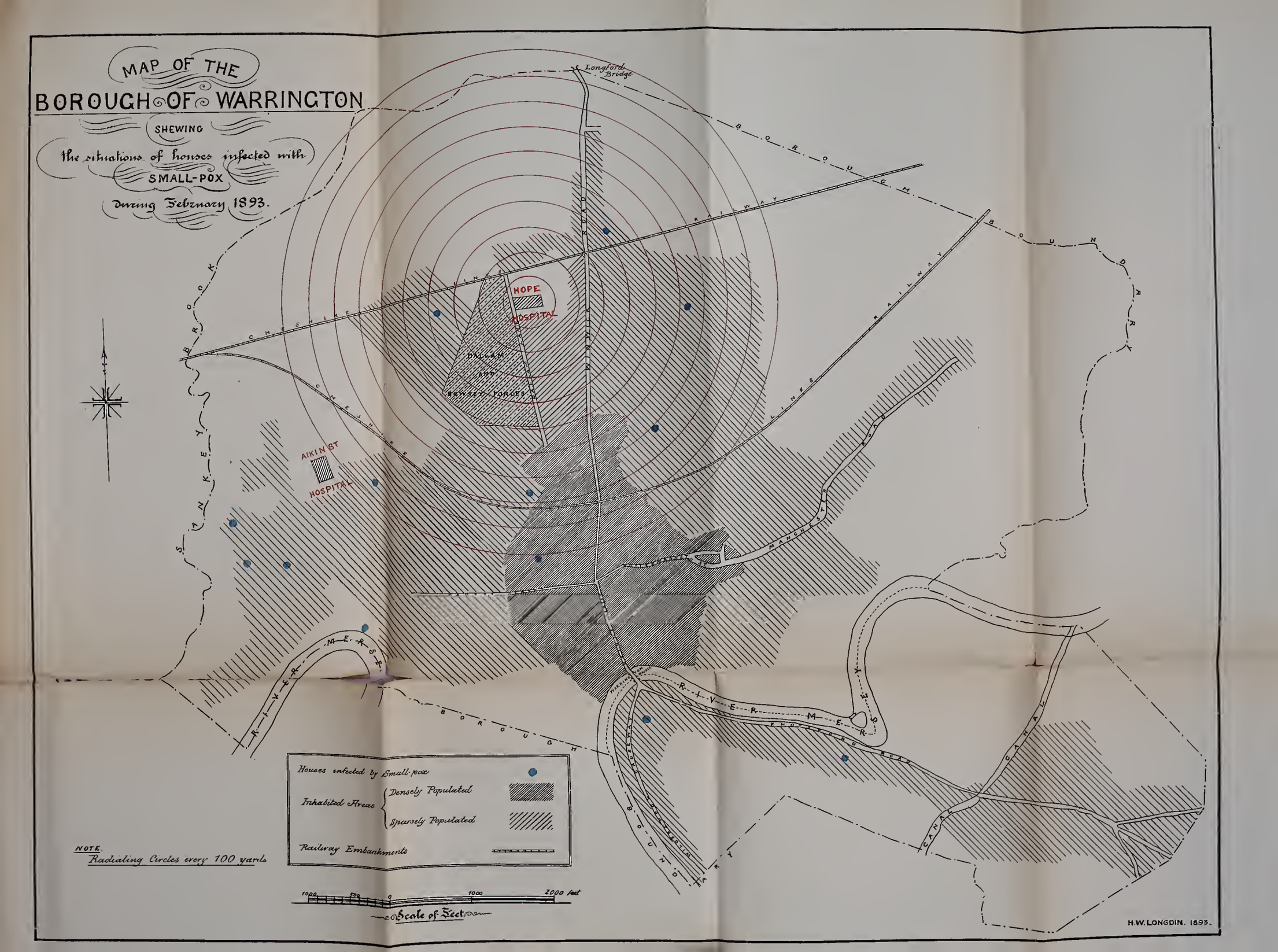


MAP OF THE BOROUGH OF WARRINGTON

SHEWING

the situations of houses infected with SMALL-POX

during February 1893.



NOTE.
Radiating Circles every 100 yards

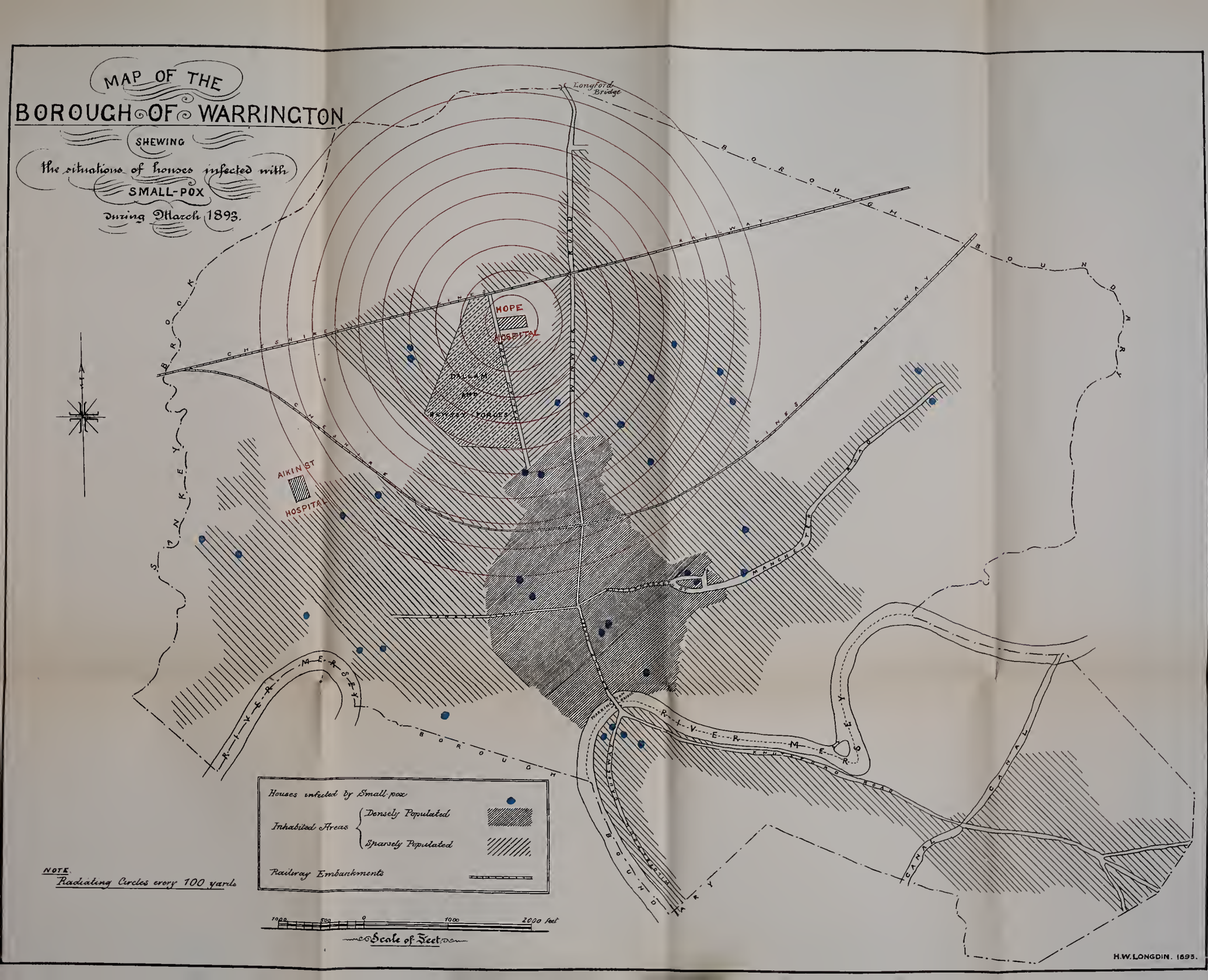
H.W. LONGDIN. 1893.

MAP OF THE BOROUGH OF WARRINGTON

SHEWING

the situations of houses infected with SMALL-POX

during March 1893.



NOTE.
Radiating Circles every 100 yards

H.W. LONGDIN. 1893.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